ICES WGIPS REPORT 2017

ACOM/SCICOM STEERING GROUP ON INTEGRATED ECOSYSTEM OBSERVATION AND MONITORING

ICES CM 2017/SSGIEOM:15

REF. SCICOM, WGISUR, ACOM, WGWIDE, AND HAWG

Interim Report of the Working Group of International Pelagic Surveys (WGIPS)

16–20 January 2017

Reykjavik, Iceland

ICES CIEM

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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Recommended format for purposes of citation:

ICES. 2017. Interim Report of the Working Group of International Pelagic Surveys (WGIPS), 16-20 January 2017, Reykjavik, Iceland. ICES CM 2017/SSGIEOM:15. 572 pp. https://doi.org/10.17895/ices.pub.8705

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Executive summary

The Working Group of International Pelagic Surveys (WGIPS) met in Reykjavik, Iceland on 16–20 January 2017, under the chairmanship of Sascha Fässler, Netherlands, and Matthias Schaber, Germany. This was the second meeting within a multiannual ToR term. The core objectives of the Expert Group are to combine and review results of annual pelagic ecosystem surveys to provide indices for the stocks of herring, sprat, mackerel, boarfish, and blue whiting in the Northeast Atlantic, Norwegian Sea, North Sea, and Western Baltic; and to coordinate timing, coverage, and methodologies for the upcoming 2017 surveys.

In addition, the meeting focused on collating and providing common code to aid survey planning, and to format, quality check, and plot data from acoustic surveys. A common WGIPS repository to store and share code on the ICES GitHub site was initiated. Abundance estimation methods for herring surveys in the North Sea and adjacent waters were harmonized to adopt design and analysis methods common to other internationally coordinated WGIPS surveys. Developments of the ICES acoustic survey database were shared among the group to facilitate its adoption as a central location to store all WGIPS survey data. Work progressed on drafting a further version of the 'SISP 9 Manual for International Pelagic Surveys (IPS)', to add updated information and detail on: the new ICES database, the data formats in use, details on scrutiny methods, the new survey analysis software StoX method, and applied ecosystem monitoring techniques.

Scrutinisation procedures employed by different participants in WGIPS coordinated surveys were reviewed, evaluated, and compared during a dedicated scrutiny session as part of the meeting. Focus was on comparing and standardizing methods used in the 3 different WGIPS survey situations/environments: western shelf, shallow shelf seas, Norwegian Sea.

Results from the WGIPS surveys in 2016 and coordination plans for the 2017 individual and multinational pelagic acoustic and larvae surveys in Northeast Atlantic waters (Multinational surveys: IBWSS, IESNS, IESSNS, HERAS, IHLS, and individual surveys: CSHAS, BFAS, ISAS, PELTIC, GERAS, 6A survey) are given in Annexes 4, 5, and 6 of this interim report.

1 Administrative details

Working Group name

Working Group of International Pelagic Surveys (WGIPS)

Year of Appointment within the current cycle

2015

Reporting year within the current cycle (1, 2 or 3)

2

Chair(s)

Sascha Fässler, The Netherlands

Matthias Schaber, Germany

Meeting venue

Reykjavik, Iceland

Meeting dates

16–20 January 2017

2 Terms of Reference a) – i)

1) Combine and review annual ecosystem survey data to provide: indices of abundance and spatial distribution for the stocks of herring, sprat, mackerel, boarfish, and blue whiting in Northeast Atlantic waters.

2) Coordinate the timing, area, effort allocation, and methodologies for individual and multinational acoustic and larvae surveys on pelagic resources in the Northeast Atlantic waters covered (Multinational surveys: IBWSS, IESNS, IESSNS, HERAS, IHLS and individual surveys: CSHAS, BFAS, ISAS, PELTIC, GERAS).

3) Adopt standardized analysis methodology and data storage format utilizing the ICES pelagic database repository for all acoustically derived abundance estimates of WGIPS coordinated surveys.

4) Periodically review and update the WGIPS acoustic survey manual to address and maintain monitoring requirements for pelagic ecosystem surveys.

5) Review and evaluate survey designs across all WGIPS coordinated surveys to ensure the integrity of survey deliverables.

6) Assess and compare scrutinisation procedures employed for the analysis of raw acoustic data from WGIPS coordinated surveys.

7) Develop alternative analysis methods (e.g. using geostatistics) to monitor the pelagic ecosystem by extracting metrics from the collected survey data other than those required for single-species stock assessments.

8) Assess auxiliary pelagic ecosystem surveying technology (e.g. optical technology, multibeam, and wideband acoustics) to: (i) achieve monitoring of different ecosystem components, and/or (ii) derive ecosystem indicators from surveys covered by WGIPS.

9) Develop and refine methods to derive stock- or spawning component-specific survey indices for herring based on biological criteria (e.g. otolith shape analysis or morphometric measurements).

3 Summary of Work plan

Year 2:

General meeting, preceded by 3 post-cruise meetings which collate data of multinational surveys.

Session to review and evaluate survey designs across all WGIPS coordinated surveys done in Year 2; and coordinate planning and discuss designs for surveys taking place in Year 3.

Session to exchange experiences and analyse progress with the use of the new standardized acoustic survey analysis tool (StoX) and data storage format from the ICES pelagic database repository.

Session to compare and evaluate scrutinisation of Year 2 survey data based on the standardized procedures developed in WKSCRUT.

Session to review and provide possible updates for the WGIPS acoustic survey manual.

Session to review and adapt stock and spawning component splitting methods applicable to herring in the North Sea, and areas 3a and 6a, and plan methods used on surveys in Year 3 accordingly.

Session to draft a manuscript on an example of alternative analysis methods (e.g. geostatistics) used with WGIPS survey data.

Session to analyse progress and draft recommendations for auxiliary pelagic ecosystem surveying methodology (e.g. optical technology, multibeam and wideband acoustics) for monitoring components of the wider ecosystem in surveys covered by WGIPS.

Session to draft a list of potential ecosystem indicators to be measured during WGIPS surveys.

4 List of Outcomes and Achievements of the WG in this delivery period

The following outcomes and achievements were obtained during this delivery period:

Indices for the stocks of herring, sprat, mackerel, boarfish, and blue whiting in Northeast Atlantic waters from annual ecosystem surveys as fishery-independent data for analytical assessment purposes in HAWG[1] and WGWIDE[2]:

- North Sea autumn spawning herring numbers, biomass, maturity proportion, mean weight, and length-at-age, from the ICES Coordinated Acoustic Survey in the Skagerrak and Kattegat, the North Sea, West of Scotland, and the Malin Shelf area (HERAS).
- Western Baltic spring-spawning herring numbers, biomass, maturity proportion, mean weight, and length-at-age, from the HERAS.
- West of Scotland autumn spawning herring numbers, biomass, maturity proportion, mean weight, and length-at-age, from the HERAS.
- Malin Shelf herring (areas 6aN-S, 7b,c) numbers, biomass, maturity proportion, mean weight, and length-at-age, from the HERAS.
- Sprat in the North Sea (Subarea 4) numbers, biomass, mean weight, and length-at-age, from the HERAS.
- Sprat in Division 3a numbers, biomass, mean weight, and length-at-age, from the HERAS.
- Norwegian spring-spawning herring numbers, biomass, mean weight, and length-at-age, from the International Ecosystem Survey in the Nordic Sea (IESNS).
- Blue whiting numbers, biomass, mean weight, and length-at-age, from the International Ecosystem Survey in the Nordic Sea (IESNS).
- Mackerel numbers, biomass, mean weight, and length-at-age, from the International Ecosystem Summer Survey in the Nordic Sea (IESSNS).
- Norwegian spring-spawning herring numbers, biomass, mean weight, and length-at-age, from the International Ecosystem Summer Survey in the Nordic Seas (IESSNS).
- Blue Whiting numbers, biomass, maturity proportion, mean weight, and length-at-age, from the ICES International Blue Whiting Spawning stock Survey (IBWSS).
- Irish Sea and North Channel (area 7a), autumn spawning herring, numbers, biomass, distribution maturity proportion, mean weight, and length-at-age.
- Western Baltic Spring-spawning Herring (including and excluding Central Baltic Herring) as well as sprat numbers, biomass, and mean weight-at-age by area for the Western Baltic (ICES Subdivisions 21, 22, 23, and 24) from the German Acoustic Autumn Survey (GERAS) of the Baltic International Acoustic Survey (BIAS).

1 Herring Assessment Working Group for the Area South of 62°N

2 Working Group on Widely Distributed Stocks

- Boarfish numbers, biomass, maturity proportion, mean weight, and length-at-age, from the Western European Shelf Pelagic Acoustic Survey (WESPAS).
- Celtic Sea herring numbers, biomass, maturity proportion, mean weight, and length-at-age, from the Celtic Sea herring Acoustic Survey (CSHAS).
- Indices of herring larvae surveys conducted prior to or ongoing during the meeting (International Herring Larvae Surveys, IHLS).

Other ecosystem survey-derived operational products:

- Zooplankton distribution in the Norwegian Sea based on dry weight samples from the IESNS and IESSNS.
- Recorded observations of marine mammals in the Norwegian Sea during the International Ecosystem Summer Survey in the Nordic Seas (IESSNS).

Other outcomes and achievements:

- 2017 survey plans (Annex 6);
- ecosystem index overview table (Annex 7);
- StoX and ICES database issues list (Annex 8);
- recalculation if IESSNS mackerel abundance with StoX document (Annex 9);
- common code to aid survey planning, and to format, quality check, and plot data from acoustic surveys and WGIPS GitHub repository initiated (https://github.com/ices-eg/WGIPS);
- draft of a further version of 'SISP 9 Manual for International Pelagic Surveys (IPS)';
- Results of dedicated scrutiny session (final analysis pending);
- Published manuscript on blue whiting distribution (http://www.science direct.com/science/article/pii/S0165783616301497).

5 Progress report on ToRs and work plan

ToR's and work plan were covered as planned, with particular focus on:

- Exchange experiences and analyse progress with the use of the StoX software package recently adopted for abundance estimates in WGIPS coordinated surveys and ICES acoustic database.
- Harmonizing design and estimation methods for HERAS surveys to be in line with other internationally coordinated WGIPS surveys.
- Combination and review of annual ecosystem survey data including discussion of results and identified issues; review and evaluation of survey designs and plans for 2017 surveys.
- Compare and evaluate scrutinisation and auxiliary pelagic ecosystem surveying methodology; and update the WGIPS acoustic survey manual.

Results of different ecosystem surveys conducted in 2016 and disseminated during preceding post-cruise meetings were shown. The combined results provided indices of abundance and distribution for stocks of herring, sprat, mackerel, boarfish, and blue whiting in Northeast Atlantic waters (*ToR a*). Timing, planning, and methods applied for individual (CSHAS, BFAS, ISAS, PELTIC, GERAS, 6A survey) and multinational (IBWSS, IESNS, IESSNS, HERAS, IHLS) surveys were discussed and evaluated (*ToR b,c*). The group was updated on developments of the new ICES acoustic database to facilitate its adoption as a survey data host location (*ToR c*). Common code was developed to aid survey planning, and to format, quality check, and plot data from acoustic surveys (*ToR c*). Work progressed on drafting a further version of the 'SISP 9 Manual for International Pelagic Surveys (IPS)', to add updated information and detail on: the new ICES database, the data formats in use, details on scrutiny methods, the new survey analysis software StoX method, and applied ecosystem monitoring techniques. (*ToR d, h*). Designs and plans of the different surveys for 2017 were established and agreed (*ToR e*). Scrutinisation procedures employed by different participants in WGIPS coordinated surveys were reviewed, evaluated, and compared as part of a dedicated session (*ToR f*). Shortcomings and implications of the new ICES acoustic database and StoX analysis software were collated in an issue list (*ToR c*).

For 2017, 26 individual surveys are planned in total under WGIPS, including 4 multinational surveys.

A manuscript on blue whiting distribution jointly authored by several group members was published (*ToR g*). The group contributed to session A ("Fisher collected acoustic data (FCAD)") at the 2016 ICES ASC through active involvement as session convener and presenters (*ToR g*).

No changes in ToR have been proposed.

6 Revisions to the work plan and justification

No changes were done in the work plan.

7 Next meeting

The 2018 meeting is proposed to be held in Amsterdam, Netherlands, on 15–19 January 2018.

Annex 1: List of participants

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Annex 2: Recommendations

Recommendation	Adressed to
As a consequence of the merging of PGNAPES and WGIPS, the group is meanwhile focussing on tasks and issues mainly related to acoustic (ecosystem) surveys. Thus, the group would recomment to transfer all WGIPS larvae surveys, producing indices for assessment purposes, into a dedicated working group. This group should be established within the next two years and should have a focus on survey design, early life stages and recruitment studies and ideally provide guidance for index calculations.	SSGIEOM
The group recommends to be actively involved in drafting the details of how and in what form aggregated data from the ICES acoustic database is going to be available to 3rd parties for download.	ICES Data Centre

Annex 3: Agenda

Monday

09:00

- Meeting opens
- Review of TOR for this year and WGIPS multiannual plan
- Review of recommendations for WGIPS from other expert groups
- Update from other relevant groups: WGSUREP, WGFAST, WKQUAD, with plenary discussion on results and their implications for WGIPS
- Updates and sharing of experiences with ICES db and StoX

14:00

- Contents of this year's report and reporting structure format
- Meeting report tasks
- Combination and review of annual ecosystem survey data: Herring Larval survey in 2016 and plan for 2017

Tuesday

09:00

- Report status
- Combination and review of annual ecosystem survey data: Review of coordinated Acoustic surveys in 2016, including plenary discussion of results and identified issues

  - International acoustic survey in North Sea, West of Scotland and Malin Shelf (HERAS) (including Sprat in the North Sea and 3a)

  - Malin Shelf (MSHAS)

  - Western Baltic (GERAS)

14:00

- 6a spawning stock survey
- International blue whiting spawning stock survey (IBWSS)
- International ecosystem survey in the Nordic Seas (IESNS)
- Coordinated Nordic Seas ecosystem survey (IESSNS)
- Celtic Sea herring (CSHAS)
- Celtic Sea, English Channel (PELTIC)
- Boarfish acoustic survey (BFAS)
- Irish Sea Herring Survey (ISHS) / Charter Extension

- Plenary discussion on identified survey issues

Wednesday

09:00

- Report status
- Age reading and stock splitting issue session:
- Update on stock and spawning component splitting methods applicable to herring in the North Sea, and areas 3a and 6a; and plan methods used on surveys accordingly
- Update on Norwegian Spring-spawning herring age reading differences and herring stock splitting in the Norwegian Sea; and plan methods used on surveys accordingly
- Presentation of Session on fishing vessel acoustics at the 2016 ICES ASC: use of "real-time" industry scouting data in the run-up to surveys to adjust/optimise survey design
- Presentation of new HERAS survey design choice based on geostatistical variance estimation
- Review and evaluate survey designs and 2017 plans across all WGIPS surveys within survey subgroups
- Plenary discussion of coordinated survey planning and designs for 2017 surveys

14:00

- Parallel theme sessions:

  Survey manual update (add details on: ICES db, data format, scrutiny details, StoX method, ecosystem monitoring, etc.)

  R scripts session (collate, develop, organize R scripts useful across the board for: survey design, planning, formatting, reporting, plotting); preceded by presentation of existing useful scripts
- Review of answers to recommendations for WGIPS from other expert groups

Thursday

09:00

- Report status
- All-day scrutiny theme session to compare and evaluate scrutinisation methods per survey areas (western shelf, shelf seas, Norwegian sea)

16:00

- Recommendations to other groups
- Discussion on further WGIPS joint publication (introduced by Gastauer *et al*. WHB paper)
- Updates to ToRs for next year
- Collection of material for the final report; review of answers to recommendations for WGIPS from other expert groups

Friday

09:00

- Review of final report
- Continuing outstanding work tasks

12:00

- Meeting closes

Annex 4: Post Cruise Reports

Annex 4a: International Blue Whiting Spawning Stock Survey (IBWSS)

Survey Summary table	
Name of the survey (abbreviation):	International blue whiting spawning survey (IBWSS)
Summary: http://hdl.handle.net/10793/1148	**Cruise Report Link:**
In total 6,257 nmi (nautical miles) of survey transects were completed areas across six strata relating to an overall geographical coverage of 134,429 nmi². This represented a reduction of 16% in total survey mileage (acoustic sampling effort) but an increase of 9% in surveyed area compared to last year. Containment in western extremes of the survey was considered sufficient. Weather conditions were good for the main body of the survey with approximately 24 hrs of downtime recorded. Towards the end of the survey, when only one vessel was surveying (M. Heinason) a further two days were lost. The International Blue Whiting Spawning stock Survey 2016 shows an increase in total stock biomass of 108% with a corresponding increase in abundance of 109% when compared to the 2015 estimate. However, the 2015 estimate was considered as an under representation of the stock in the time series due to the missing dominant age classes and reduced biomass observed.	
	Description
Survey design	Stratified systematic parallel design (30 & 20 nmi spacing) with randomised start point.
Index Calculation method	StoX (via the PGNAPES database)
Random / systematic error issues	NA, outside of those described for standardised acoustic surveys
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	Weather conditions were regarded as good overall but some weather induced downtime was recorded. Issues exist with smaller vessels and those without a drop keel.
Extinction (shadowing)	No particular issues
Blind zone	NA
Dead zone	No particular issues
Allocation of backscatter to species	Directed trawling for verification purposes
Target strength	Recommended values for blue whiting
Calibration	All survey vessels and frequencies calibrated and results within recommended tolerances

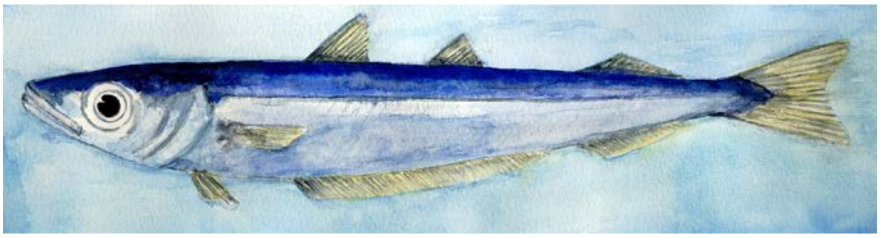
Working Document

Working Group on International Pelagic Surveys

Reykjavík, Iceland, January 2017

Working Group on Widely Distributed Stocks

Copenhagen, Denmark, September 2016



INTERNATIONAL BLUE WHITING SPAWNING STOCK SURVEY (IBWSS) SPRING 2016

Ebba Mortensen[4^*], Jan Arge Jacobsen[4*], Leon Smith[4*], Regin Kristiansen[4], Poul Vestergaard[4]

R/V Magnus Heinason

Ben Scoulding[1*], Kees Bakker[1], Thomas Pasterkamp[1], Dirk Burggraaf[1], Eric Armstrong[6], Dirk Thijssen[8], Felix Muller[7], Laila Higgins[5], Bram Couperus[1*]

R/V Tridens

Graham Johnston[5], Ciaran O'Donnel[5*], Eugene Mullins[5], Niall Keogh[9], Rossa Meade[10]

R/V Celtic Explorer

Valery Ignashkin[3*]

Russian Federation

Åge Høines[2*], Are Salthaug[2*], Espen Johnsen[2*], Valantine Anthonypillai[2*]

M/S Brennholm

1 Institute for Marine Resources & Ecosystem Studies, IJmuiden, The Netherlands
2 Institute of Marine Research, Bergen, Norway
3 PINRO, Murmansk, Russia
4 Faroe Marine Research Institute, Tórshavn, Faroe Islands
5 Marine Institute, Galway, Ireland
6 Marine Scotland Marine Laboratory, Aberdeen, Scotland, United Kingdom
7 Johann Heinrich von Thünen-Institut, Hamburg, Germany
8 Danish Institute for Fisheries Research, Denmark
9 BirdWatch, Ireland

10 Galway/Mayo Institute of technology
* Participated in post cruise meeting,
^ Survey coordinator

Material and methods

Survey planning and Coordination

Coordination of the survey was initiated in the meeting of the Working Group on International Pelagic Surveys (WGIPS) and continued by correspondence until the start of the survey. During the survey effort was refined and adjusted by the coordinator based on real time observations. Participating vessels together with their effective survey periods are listed below:

Vessel	Institute	Survey period
Celtic Explorer	Marine Institute, Ireland	20/3 – 03/4
Magnus Heinason	Faroe Marine Research Institute, Faroe Islands	1/4 – 11/4
Tridens	Institute for Marine Resources & Ecosystem Studies (IMARES), the Netherlands	21/3 – 5/4
Brennholm	Institute of Marine Research, Norway	24/3 – 4/4

The survey design applied followed methodss described in ICES Survey design Manual (2015) and allowed for a flexible transect design and comprehensve coverage of the spawning aggregations. Overall weather conditions were good during the survey with a total of 3 days weather down time recorded. Transects undertaken by all vessels were consistent in spatial coverage and timing, delivering full coverage of the respective distribution areas within 23 days.

Cruise tracks and survey strata are shown in Figure 1. Trawl stations for each participant vessel are shown in Figure 2 and CTD stations in Figure 3. All vessels worked in a northerly direction (Figure 4). Communication between vessels occurred twice daily via email to the coordinator exchanging up to date infromaion on blue whiting distribution, echograms, fleet activity and biological information.

Sampling equipment

Vessels employed a midwater trawl for biological sampling, the properties of which are given in Table 1. Acoustic equipment for data collection and processing are presented in Table 2. Survey abundance estimates are based on acoustic data collected from calibrated scientific echo sounders using an operating frequency of 38 kHz. All transducers were calibrated with a standard calibration sphere (Demer et al. 2015) prior, during or directly after the survey. Acoustic settings by vessel are summarised in Table 2.

Biological sampling

All components of the trawl haul catch were sorted and weighed; fish and other taxa were identified to species level. The level of blue whiting sampling by vessel is shown in Table 3.

Hydrographic sampling

Hydrographic sampling by way of vertical CTD casts were carried out by each participant vessel at predetermined locations (Figure 3 and Table 3). Depth was capped at a maximum depth of 1000 m (Magnus Heinason 450 m) in open water, with the exception of a dedicated hydrographic transect where full depth was achieved. Equipment specifications are summarised in Table 1.

Plankton sampling

Plankton sampling by way of vertical WP2 casts were carried out by Brennholm (NO) and Magnus Heinason (FO) to depths of 400m and 200m respectively (Table 3).

Acoustic data processing

Acoustic scrutiny was based on categorisation by experienced experts aided by trawl composition information. Post-processing software and procedures differed among the vessels:

On Celtic Explorer, acoustic data were backed up every 24 hrs and scrutinised using EchoView (V.6) post-processing software for the previous day's work. Data was partitioned into the following categories: plankton (<120 m depth layer), mesopelagic species and blue whiting.

On Magnus Heinason, acoustic data were scrutinised every 24 hrs on board using EchoView (V 7.090) post processing software. Data were partitioned into the following categories: plankton (<200 m depth layer), mesopelagic species, blue whiting and krill. Partitioning of data into the above categories was based on trawl samples.

On Tridens, acoustic data were backed up continuously and scrutinised every 24 hrs using the Large Scale Survey System LSSS (V.1.9) post-processing software. Blue whiting were identified and separated from other recordings based on trawl catch information and characteristics of the recordings.

On Brennholm, the acoustic recordings were scrutinized using LSSS (V. 1.10.0) once or twice per day. Data was partitioned into the following categories: plankton (<120 m depth layer), mesopelagic species and blue whiting.

Acoustic data analysis

Acoustic data were analysed using the StoX software package recently adopted for WGIPS coordinated surveys. A description of StoX can be found here: http://www.imr.no/forskning /prosjekter/stox/nb-no. Estimation of abundance from acoustic surveys with StoX is carried out according to the stratified transect design model developed by Jolly and Hampton (1990). Since this new method required pre-defined strata, the WGIPS in January 2016 designed a new set of strata to be used for IBWSS 2016 (see Figure 1). The new strata were partly based on the previously used sub-areas (see Figure 6 in Appendix 4A, ICES 2016). The strata used in the 2016 IBWSS were adjusted slightly in StoX, mainly in the western fringes where some transects were shortened due to zero registrations of blue whiting. The strata and transects used in StoX are shown in Figure 1 and 5. All trawl stations within a given stratum with catches of blue whiting where assigned to all transects within the stratum, and the length distributions where weighted equally within the stratum (Figure 5).

Following the decisions made at the “Workshop on implementing a new TS relationship for blue whiting abundance estimates (WKTSBLUES)” (ICES 2012), the following target strength (TS)-to-fish length (L) relationship (Pedersen et al. 2011) used is:

$$TS = 20 \log10 (L) - 65.2$$

In StoX a superindividual table is produced where abundance is linked to population parameters like age, length, weight, sex, maturity etc. (exact name: 1_FillMissingData_SuperIndividuals.txt). This table can be used to split the total abundance estimate by any combination of population parameters.

Estimate of relative sampling error

For the baseline run StoX estimates the number of individuals by length group which can be further grouped into population characteristics such as numbers at age and sex.

For the baseline run, the user defines which trawl stations should be assigned to the individual acoustic primary samples (typically transects). In simple terms, a total length distribution of the species of interest is calculated by transect using all the trawl stations assigned to the individual transects. Conversion from NASC (by transect) to mean density by length group by stratum use the calculated length distribution and a standard target strength equation with user defined parameter values. Thereafter, the mean density by stratum is estimated by using a standard weighted mean function where each transect density is weighted by transect distance. The number of individuals by stratum is given as the product of stratum area and area density.

The bootstrap procedure to estimate the coefficient of variance follows the same principle as in the baseline run. However, for each run, transects within a stratum are selected randomly with replacement, and for each selected transect, the trawl stations which are assigned for the selected transect are randomly sampled with replacement. Thereafter, each run follows the same estimation procedure as described above. The output of all the runs is stored in a RData-file, which is used to calculate the relative sampling error.

Results

Distribution of blue whiting

In total 6,257 nmi (nautical miles) of survey transects were completed areas across six strata relating to an overall geographical coverage of 134,429 nmi.² (Figure 1, Tables 3). This represented a reduction of 16% in total survey mileage (acoustic sampling effort) but an increase of 9% in surveyed area compared to last year (Table 7). Coverage was considered sufficient and still takes into account expected distributions on the Rockall and Porcupine Banks. The distribution of blue whiting as observed during the survey is shown in Figures 6 and 7.

The bulk of the stock was located in the 3 strata bordering the shelf edge (Strata 1, 2 and 3) accounting for over 67% of total biomass (Table 4). The 3 western most strata accounted for the remaining biomass which was distributed in relatively equal proportions of approximately 10% of TSB per stratum. The maximum s_A values observed in the survey were recorded in strata 2 (North Porcupine Bank) close to the shelf slope (34,001 m^2/nmi^2) by Tridens (Figure 8a) and by the Brennholm in strata 3 (Rockall Trough) in open water (32,045 m^2/nmi^2, Figure 6b). Low density registrations dominated the Rockall strata. Strata 1 (Porcupine Bank) contained a low number of mixed of medium and high density registrations as observed by the Celtic Explorer (Figure 8c). Northern strata (4 and 6) were dominated by numerous low to medium density registrations as observed by the Magnus Heinason (Figure 8d).

Stock size

The estimated total abundance of blue whiting for the 2016 international survey was 2.87 million tonnes, representing an abundance of 34.4×10^9 individuals (text table below). Spawning stock was estimated at 2.27 million tonnes and 25.33×10^9 individuals (Tables 4 and 5).

Strata	Name	TSB (10^3 t)	TSN (10^9)	% TSB	% TSN
1	Porcupine Bank	236 089.3	2 744 672	8.2	8.0
2	N Porcupine Bank	335 107.0	4 077 720	11.7	11.8
3	Rockall Trough	1 376 177.4	14 876 900	47.9	43.2
4	South Faroes	322 791.7	4 321 344	11.2	12.5
5	Rockall Bank	295 262.5	3 913 476	10.3	11.4
6	Faroe/Shetland Ch.	307 220.3	4 512 647	10.7	13.1
	Total	2 872 648	34 446 759	100	100

Stock composition

Individuals of ages 1 to 17 years were observed during the survey.

The main contribution (82%) to the spawning stock biomass were the age groups 3, 4, 5 and 2 in order of importance (Table 5), with 3-year old fish contributing 26% to total biomass.

The Rockall Trough is historically the most productive stratum accounting for upwards of 50% of the SBB in all years with the exception of 2013-2014 (48% and 44% respectively in these years). In 2016 this stratum accounted for 55% of SSB (Table 4). Mean lengths and weights of the fish caught in the Rockall Trough area were highest in the entire survey (Figures 9 and 10).

The two northern strata (South Faroes stratum 4 and Faroese/Shetland stratum 6) were found to contain significant proportion of young blue whiting (1-3 years), all together 75% (230.000) of the total biomass and 84% (4513 million individuals) of the total abundance in that area (see text table above), which is similar to the proportions seen in 2014 (70% and 85% respectively) and 2015 (75% and 84% respectively).

The South Faroes and Faroes-Shetland Channel strata were dominated by 1 to 3 year old fish and Porcupine Bank was dominated by 3 to 5 year old fish. In comparison the composition of North Porcupine stratum consisted of younger fish (2 and 3 year old). As in previous years one year old fish was mainly observed in the area north of the (Stratum 4 and 6) and oldest fish (>8+) were predominantly observed in the Rockall Trough stratum (average length and weight, Figures 12 and 13).

The Rockall Bank estimate was composed of limted trawl samples (2 stations)and so provides a limited sample of biomass within this area. Mean length was 24.5cm, the lowest of all strata. As a result the length and age composition from this stratum is considered biased and not representative.

Immature blue whiting were founbd in varying number in all strata in 2016 (Table 4). Maturity analysis of survey samples indicate that 3% of 1-year old, 75% of 2-year old and 76% of 3-year old fish were mature (Table 5) as compared to the 2015 estimates, where 9% of 1-year old fish, 66% of 2-year old fish and 83% of 3-year old fish were considered mature (Table 4, ICES 2016).

Immature blue whiting from the 2016 estimate represented 21% (600,000 t) of the total biomass and 26% (9,007 million) of the total abundance recorded during the survey. This is comparable to 2015 (17% - 239,000 t total biomass; 32% - 5,380 million total abundance). In last years joint cruise report this was considered an indication that the mature part of the stock was drastically reduced, given the much lower proportions of immature in 2014 (biomass 7.4%; abundance 15%).

An uncertainty estimate based on a comparison of the abundance estimates by age was calculated for IBWSS for years 2014, 2015 and 2016 using StoX (Figure 11). It was possible to compare the progress of individual year classes, and by comparing the estimates of young year classes from 2014 to 2016 it appears evident that consistency from one year to the next is acceptable for some year classes. For example the one year olds in 2014 (2013 year class) were high and also as two year olds in 2015 and three year olds in 2016. However, the level in the estimates in 2015 was significantly lower than in the 2014 and 2016 estimates. Indicating that the 2015 survey might be biased.

The survey time series (2004-2016) of TSN and TSB has been recalculated using StoX (including uncertainty estimates) and compared to the Beam estimates, and are presented in Figures 14 and 15 respectively. Comparative estimates are realtively consistent across yearsas all the yearly point estimates from BEAM are within one standard deviation of the corresponding StoX estimates. The international survey time series (2004-2016) was recalculated using StoX and the results of this exercise are presented in Table 6.

Hydrography

A combined total of 110 CTD casts were undertaken over the course of the survey (Table 1). Horizontal plots of temperature and salinity at depths of 50m, 100m, 200m and 450m as derived from vertical CTD casts are displayed in Figures 16-19 respectively.

Concluding remarks

Main results

- Weather conditions were good for the main body of the survey with approximately 24 hrs of downtime recorded. Towards the end of the survey, when only one vessel was surveying (M. Heinason) a further two days were lost.
- Total area coverage increased by 9% in 2016 compared to 2015. This is in part due to the implementation of revised survey strata adopted during planning at WGIPS and due to extended coverage on the western fringe of the Rockall Bank.
- Acoustic sampling effort (transect miles) was 16% lower in 2016 compared to 2015 and trawl sampling was 6% lower. This is directly related to the number of vessels participating (no Russian vessel) and the allocation of survey effort to the remaining 4 vessels to ensure coverage.
- The 13th International Blue Whiting Spawning stock Survey 2016 shows an increase in total stock biomass of 108% with a corresponding increase in abundance of 109% when compared to the 2015 estimate.
- The survey was carried out over 23 days and just outside the recommended 21 day time window agreed by the group.
- Estimated uncertainty around the total stock biomass remains low but is slightly higher in 2016 compared to 2015 (CV=0.14, CV=0.12 respectively).
- The stock biomass within the survey area was dominated by 3, 4, 5 and 2 year old fish, contributing over 80% of total stock biomass.
- The age structure of the 2016 estimate is considered representative of the actual age structure of the stock compared to the 2015 estimate. Dominant age classes appear in expected proportions which was not the case in 2015
- The proportion of immature fish within the estimate represented 22% of the total biomass and 26% of total abundance. Strata 4 (south Faroes) contained the largest proportion of immature fish; 81% of biomass, followed by strata 6 (Faroe/Shetland Channel) with 62% biomass.

Interpretation of the results

- The group considers the 2016 estimate of abundance as robust. Good stock containment was achieved for both core and peripheral strata. Sampling effort (biological and acoustic), although slightly lower due to the reduced vessel number, provided full coverage of the stock within the survey area.
- The 2016 survey estimate and distribution pattern justifies concerns regarding the 2015 survey. The 2016 estimate is more closely aligned with trends observed in biomass and age structure during the period 2011-2014 making the 2015 estimate an outlier in the time series.
- The bulk of SSB was distributed from north of the Porcupine Bank and continued northwards through the Rockall Trough. The highest densities were observed further south compared to 2015 indicating a later timing of peak spawning. This was confirmed by the presence of early stage eggs within plankton samples. The distribution of immature fish in the northern strata follows results from previous surveys and would indicate growth of the stock through positive recruitment.

Recommendations

- The group recommends that aged blue whiting samples put forward for inclusion into the analysis be more closely scrutinised and are not accepted without review.The group recommends that 5 vessels are used to cover the survey area as in previous years to maintain consistency in sampling effort (biological and acoustic) and timing. If a vessel is unable to participate then every effort should be made to notify the group as far in advance as possible to allow for the reallocation of effort.
- The group recommends that a WP2 plankton sampling program is initiated in 2017 to track the progress of spawning during the survey. In 2017 a number of predetermined stations will be defined to cover core and preriferal areas to compliment data already collected by Norway since 2011 during planning. The number of stations will be moderate to provide a good sense of spawning progression while being aware of time and sample processing constraints. (WGIPS and WGMEGS)
- To achieve and maintain a high level of consistency between the age reading of blue whiting by the different nations, the group recommends that the current blue whiting otolith exchange program should be made available and discussed at the next WGIPS. Workshop coordinators are Jane Godiksen jane.godiksen@imr.no and Patrícia Gonçalves patricia@ipma.pt.
- The group recommends that vessels report trawl positions in the daily report and that these are plotted along with cruise track progression by the coordinator.

Achievements

- The entire survey area (136,445 nmi²) was covered in 23 days just over the group recommendation of 21 days, an achievement considering the reduced vessel number.
- The number of aged samples used in the analysis was maintained at a comparable level to 2015 with one less survey vessel. However, the number of trawl stations and transect miles (acoustic sampling) was less.
- Survey data was delivered for upload to the PGNAPES database in a timely fashion and ahead of the post cruise meeting.
- The global estimate of abundance for blue whiting was calculated exclusively using StoX in 2016. The International survey time series (2004-2015) was recalculated using StoX as a sensitivity exercise and the results were presented at WGIPS 2016. The group agreed that ‘Beam’ and StoX calculated estimates were comparable. The StoX revised time series (2004-2015) was sent forward for use in the intermediate blue whiting benchmark in early 2016.

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Table 1. Country and vessel specific details, IBWSS March-April 2016.

	Celtic Explorer	Magnus Heinason	Tridens	Brennholm
Trawl dimensions				
Circumference (m)	768	640	1120	832
Vertical opening (m)	50	40	30-70	45
Mesh size in codend (mm)	20	40	20	40
Typical towing speed (kn)	3.5-4.0	3.0-4.0	3.5-4.0	3.5-4.0
Plankton sampling	0	21	0	28
Sampling net	-	WP2 plankton net	-	WP2 plankton net
Standard sampling depth (m)	-	200	-	400
Hydrographic sampling				
CTD Unit	SBE911	SBE25	SBE911	SBE25/SAIV SD208
Standard sampling depth (m)	1000	500	1000	1000

Table 2. Acoustic instruments and settings for the primary frequency, IBWSS March-April 2016.

	Celtic Explorer	Magnus Heinason	Tridens	Brennholm
Echo sounder	Simrad EK 60	Simrad EK60	Simrad EK 60	Simrad EK 60
Frequency (kHz)	**38**, 18, 120, 200	**38**	18, **38**, 70, 120, 200, 333	18, **38**, 120, 200, 333
Primary transducer	ES 38B	ES 38B	ES 38B	ES 38B
Transducer installation	Drop keel	Hull	Drop keel	Drop keel
Transducer depth (m)	8.7	3	8	8.5
Upper integration limit (m)	15	7	15	15
Absorption coeff. (dB/km)	9.9	10.2	10	9.9
Pulse length (ms)	1.024	1.024	1.024	1.024
Band width (kHz)	2.425	2.43	2.43	2.43
Transmitter power (W)	2000	2000	2000	2000
Angle sensitivity (dB)	21.9	21.9	21.9	21.9
2-way beam angle (dB)	-20.6	-20.8	-20.6	-20.6
Sv Transducer gain (dB)				
Ts Transducer gain (dB)	25.85	25.61	26.26	24.88
s_A correction (dB)	-0.64	-0.64	-0.53	-1.75
3 dB beam width (dg)				
alongship:	6.89	7.1	7	7.04
athw. ship:	6.96	7.08	6.95	7
Maximum range (m)	750	750	750	750
Post processing software	Myriax Echoview	Myriax Echoview	LSSS	LSSS

Table 3. Survey effort by vessel, IBWSS March-April 2016.

Vessel	Effective survey period	Length of cruise track (nmi)	Trawl stations	CTD stations	Plankton sampling WP2-net	Aged fish	Length-measured fish
Celtic Explorer	19/3-3/4	2,008	8	31	-	300	900
Magnus Heinason	1/4-11/4	1,210	9	21	19	524	1,916
Brennholm	24/3- 4/4	1,675	15	28	28	417	1,374
Tridens	21/3-5/4	1,364	13	30	-	1,200	1,200
Total	23/3-10/4	6,257	45	110	47	2,441	5,390

Table 4. Abundance and biomass estimates of blue whiting by stata. IBWSS March-April 2016.

			Numbers (10^9) mature			Biomass (10^6 tonnes)			Mean weight	Mean length	Density tonnes/
/Strata		nmi2	Mature	Total	%mature	Mature	Total	%mature	(g)	(cm)	nmi^2
I	Porcupine Bank	18 122	2.47	2.74	90	0.22	0.24	92	86	25.9	13.2
II	N. Porcupine Bank	7 138	4.05	4.07	99	0.33	0.34	100	82.2	25.5	47.6
III	Rockall Trough	38 192	12.93	14.88	87	1.24	1.37	91	92.5	26.4	35.9
IV	South Faroes	17 093	0.59	4.32	14	0.06	0.32	19	74.8	22.8	18.7
V	Rockall Bank	42 162	3.81	3.91	99	0.29	0.3	98	75.5	24.5	7.1
VI	Faroe/ Shetland Ch.	11 721	1.48	4.51	33	0.12	0.31	38	68.1	22.4	26.4
Tot.		134 428	25.33	34.43	74	2.27	2.88	79	79.8	25.1	21.4

Table 5. Survey stock estimate of blue whiting, IBWSS March-April 2016.

Length	Age in years (year class)											Number	Biomass	Mean	Prop
Length	1	2	3	4	5	6	7	8	9	10+	unkn.			weight	Mature
(cm)	2015	2014	2013	2012	2011	2010	2009	2008	2007			(10^6)	(10^6 kg)	(g)	
15-16											3	3			
16-17	50											50	1.3	25	0
17-18	280											280	8.0	28	0
18-19	587											587	20.0	34	2
19-20	868	57										925	36.0	39	8
20-21	585	830	5									1420	63.3	45	49
21-22	301	1955	256									2511	130.7	52	60
22-23	54	2661	1256	23	16							4011	240.9	60	67
23-24	20	1678	2049	319	25							4092	273.1	67	63
24-25		565	1948	764	142							3419	250.9	73	72
25-26		100	2282	1322	247	40						3990	314.5	79	87
26-27		25	1317	1285	599	126	26					3380	294.9	87	84
27-28		0	683	719	903	318	61	36				2719	261.7	96	90
28-29		0	222	649	801	295	3	0	3			1973	209.9	106	86
29-30		23	80	396	799	250	57	0	4			1610	186.8	116	98
30-31			57	299	526	170	108	0	0			1160	149.1	129	94
31-32			0	241	241	117	18	6	3	11		638	90.7	142	93
32-33			8	83	156	46	14	0	45	33		385	61.6	160	100
33-34				51	98	40	29	0	38	57		314	55.4	176	100
34-35				56	54	69	44	0	53	70		347	66.7	192	100
35-36				58	25	38	8	42	0	33		204	42.2	207	100
36-37				8	31	29	6	34	23	47		177	41.2	233	100
37-38					16		8	8	39	51		121	29.5	244	100
38-39					9		0	8	26	0		43	11.3	266	100
39-40							15			16		30	9.5	315	100
40-41							0			18		18	4.9	280	100
41-42							9			9		18	6.9	394	100
42-43							7			0		7	2.7	388	100
43-44										9		9	3.3	378	100
45-46										8		8	5.7	704	100
TSN(mill)	2745	7893	10164	6274	4687	1539	413	133	235	361	3	34447			
TSB(1000 t)	109.2	460.1	760.2	596.7	526.5	192.4	65.2	26.3	48.9	87.1		2872.7			
Mean length(cm)	19.3	22.2	24.6	26.8	28.5	29.2	31.2	33.4	34.6	35.8	15.5				
Mean weight(g)	40	58	75	95	112	125	158	197	208	240					
% Mature	3	75	76	81	87	92	99	100	100	100					
SSB (1000kg)	3.6	342.8	581.5	482.8	458.9	176.1	64.6	26.3	48.9	87.1		2272.7			

Table 6. Time series of StoX abundance estimates of blue whiting (millions) by age in the IBWSS. Total biomass in last column (1000 t).

	Age										
Year	1	2	3	4	5	6	7	8	9	10+	TSB
2004	1 097	5 538	13 062	15 134	5 119	1 086	994	593	164		3 505
2005	2 129	1 413	5 601	7 780	8 500	2 925	632	280	129	23	2 513
2006	2 512	2 222	10 858	11 677	4 713	2 717	923	352	198	31	3 512
2007	468	706	5 241	11 244	8 437	3 155	1 110	456	123	58	3 274
2008	337	523	1 451	6 642	6 722	3 869	1 715	1 028	269	284	2 639
2009	275	329	360	1 292	3 739	3 457	1 636	587	250	162	1 599
2010*											
2011	312	1 361	1 135	930	1 043	1 712	2 170	2 422	1 298	250	1 826
2012	1 141	1 818	6 464	1 022	596	1 420	2 231	1 785	1 256	1 022	2 355
2013	586	1 346	6 183	7 197	2 933	1 280	1 306	1 396	927	1 670	3 107
2014	4 183	1 491	5 239	8 420	10 202	2 754	772	577	899	1 585	3 337
2015	3 255	4 565	1 888	3 630	1 792	465	173	108	206	247	1 403
2016	2 745	7 893	10 164	6 274	4 687	1 539	413	133	235	256	2 873

*Survey discarded.

Table 7. Comparable survey effort in the IBWSS.

Survey effort	Survey area (nmi²)	Transect n. miles (nmi)	Trawls	CTDs	Plankton	Bio sampling (WHB) Measured	Aged
2004	149 000		76	196			
2005	172 000	12 385	111	248	-	29 935	4 623
2006	170 000	10 393	95	201	-	7 211	2 731
2007	135 000	6 455	52	92		5 367	2 037
2008	127 000	9 173	68	161	-	10 045	3 636
2009	133 900	9 798	78	160	-	11 460	3 265
2010	109 320	9 015	62	174	-	8 057	2 617
2011	68 851	6 470	52	140	16	3 810	1 794
2012	88 746	8 629	69	150	47	8 597	3 194
2013	87 895	7 456	44	130	21	7 044	3 004
2014	125 319	8 231	52	167	59	7 728	3 292
2015	123 840	7 436	48	139	39	8 037	2 423
2016*	134 429	6 257	45	110	47	5 390	2 441

* No Russian vessel in 2016

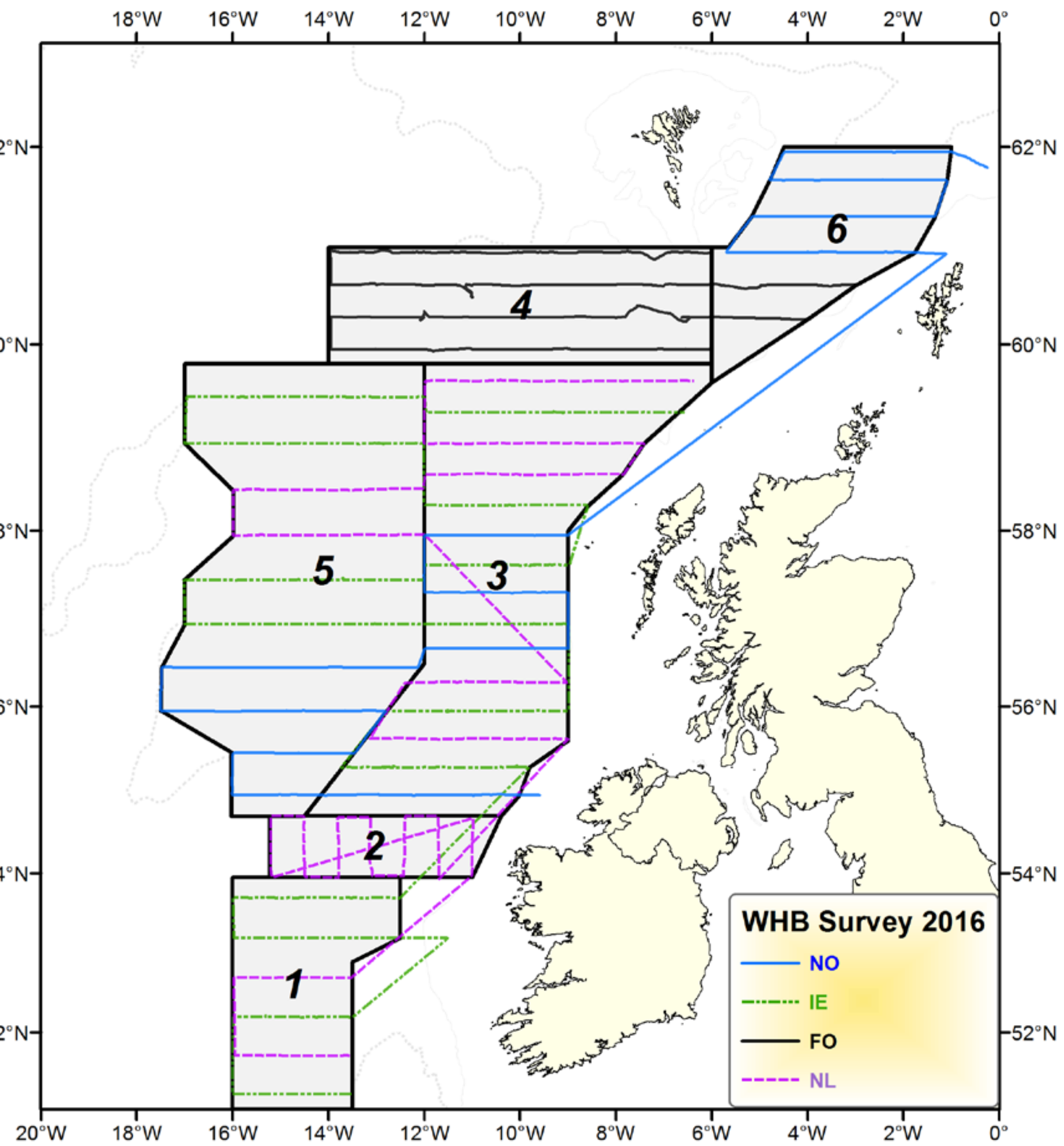


Figure 1. Strata and cruise tracks for the individual vessels (country) during the International Blue Whiting Spawning Stock Survey (IBWSS) from March-April 2016.

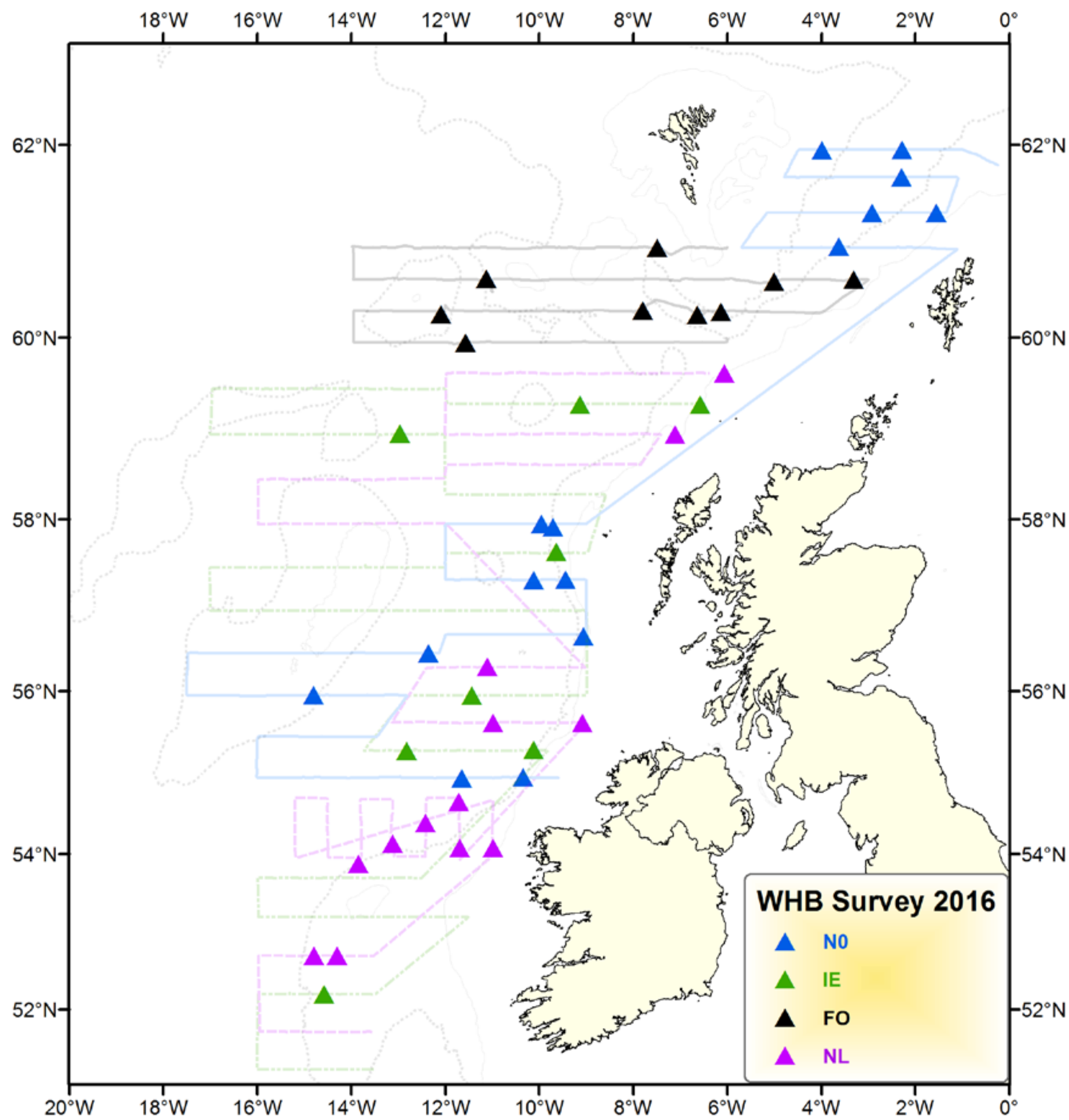


Figure 2. Vessel cruise tracks and trawl stations of the International Blue Whiting Spawning Stock Survey (IBWSS) from March-April 2016. IE: Ireland (Celtic Explorer); FO: Faroe Islands (Magnus Heinason); NL: Netherlands (Tridens); NO: Norway (Brennholm).

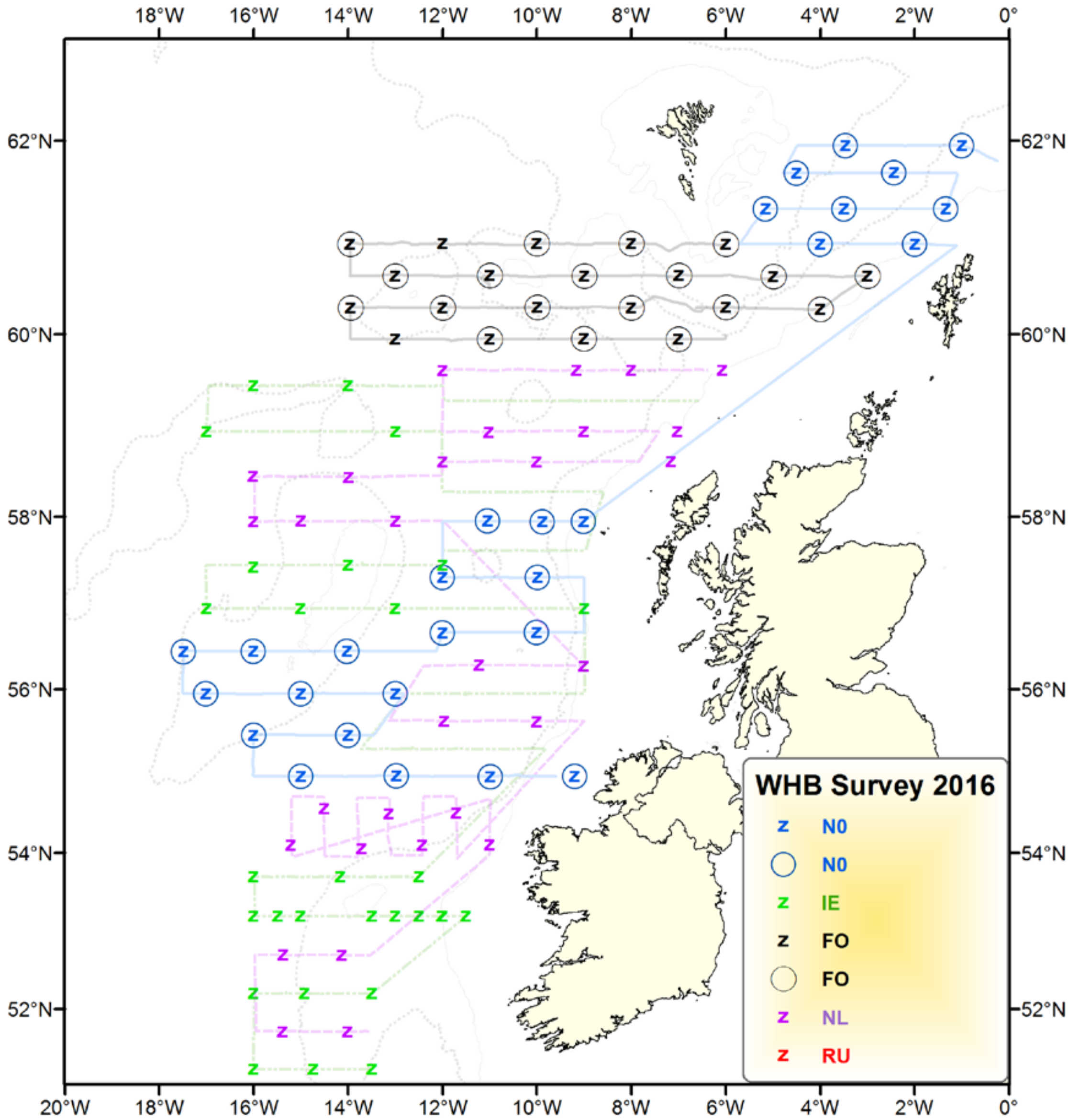


Figure 3. Vessel cruise tracks with hydrographic CTD stations (z) and WP2 plankton net samples (citrcles) during the International Blue Whiting Spawning Stock Survey (IBWSS) from March-April 2016. Coulor represents different vessels.

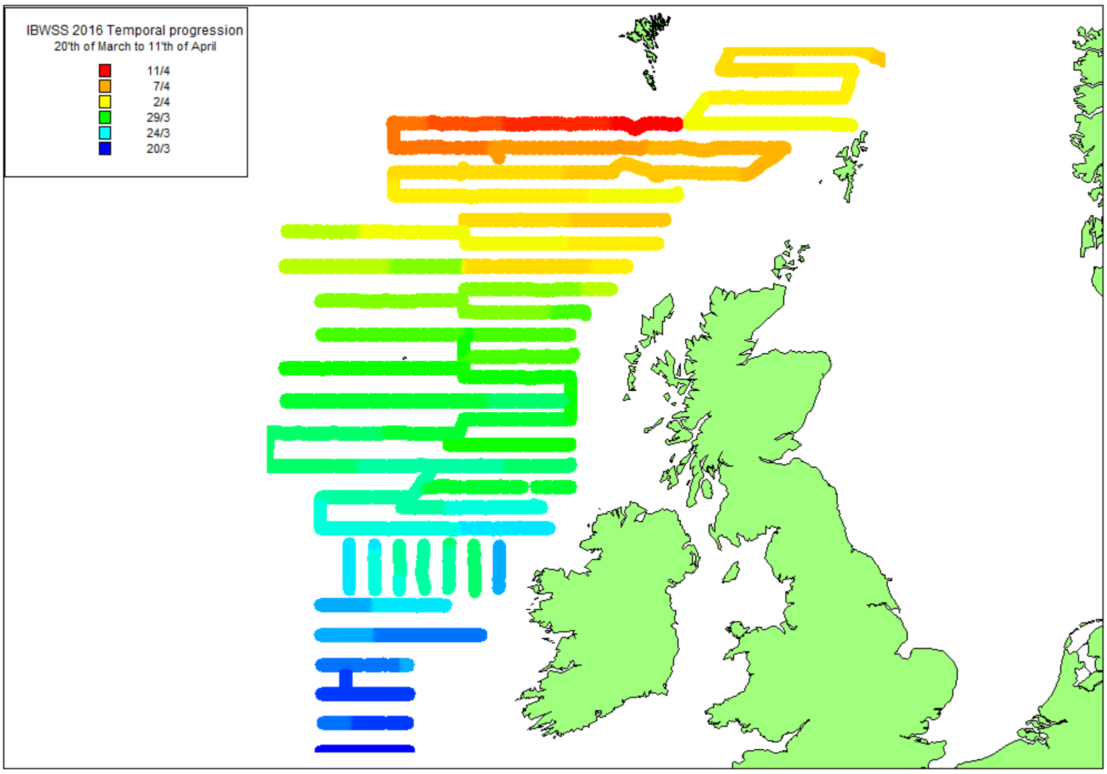


Figure 4. Temporal progression for the International Blue Whiting Spawning Stock Survey (IBWSS) from March-April 2016.

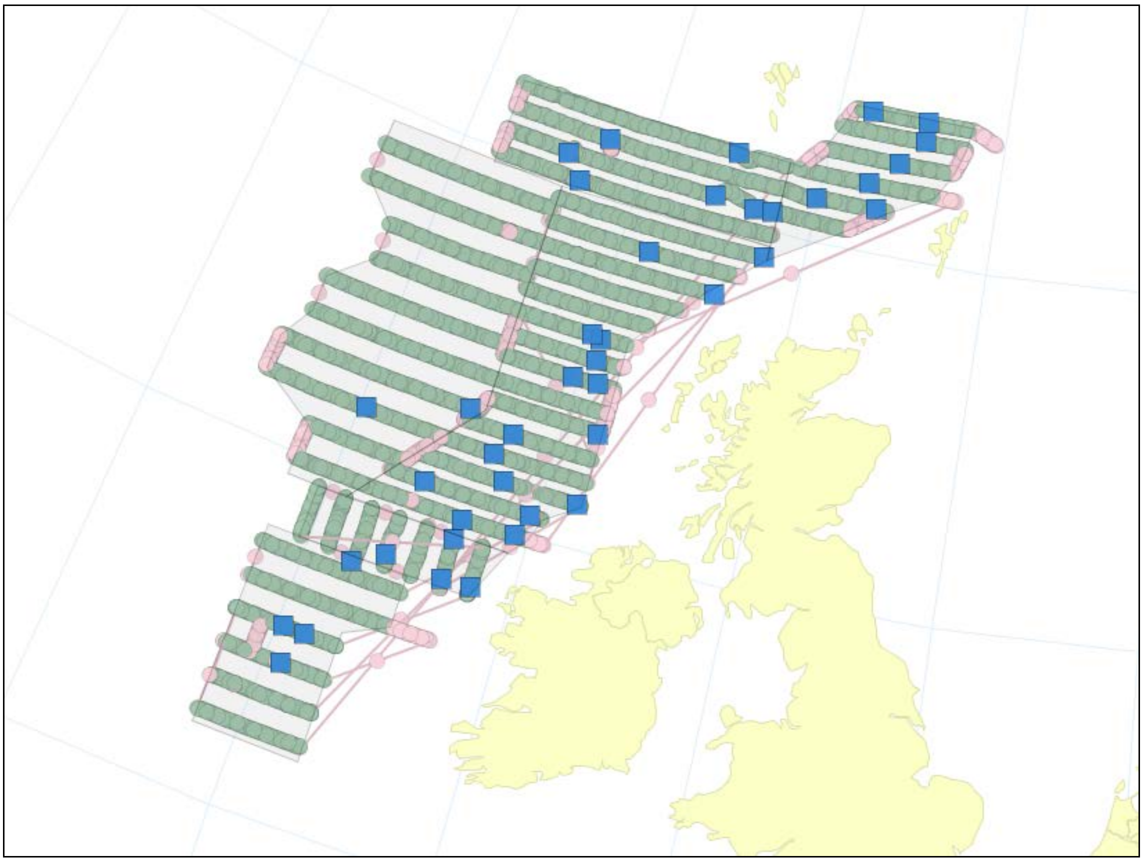


Figure 5. Tagged acoustic transects (green squares) with acociated trawlstations (blue squares) used in the StoX abundance estimation. IBWSS March-April 2016.

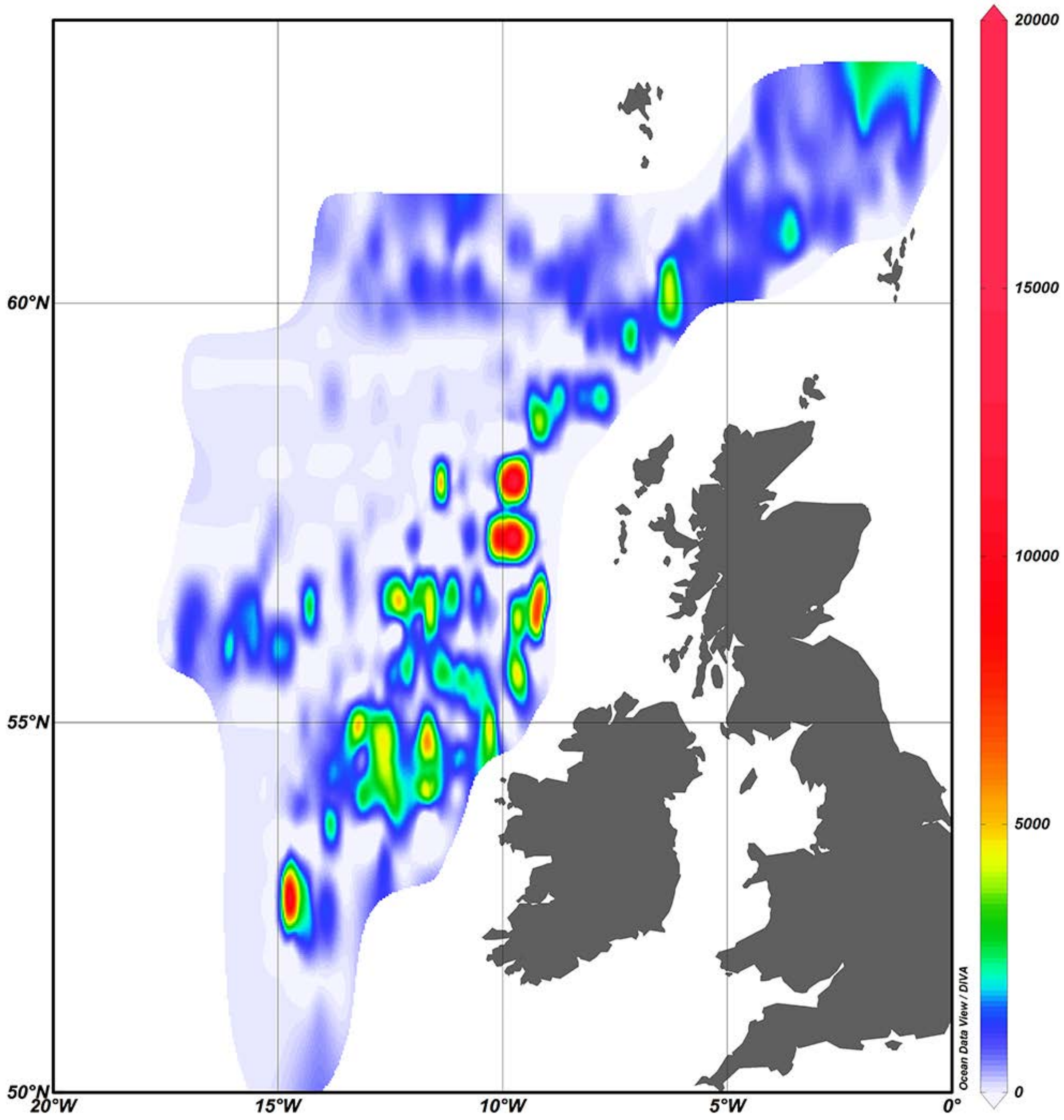


Figure 6. Map of acoustic density (s_A m^2/nmi^2) of blue whiting during the International Blue Whiting Spawning Stock Survey (IBWSS) from March-April 2016.

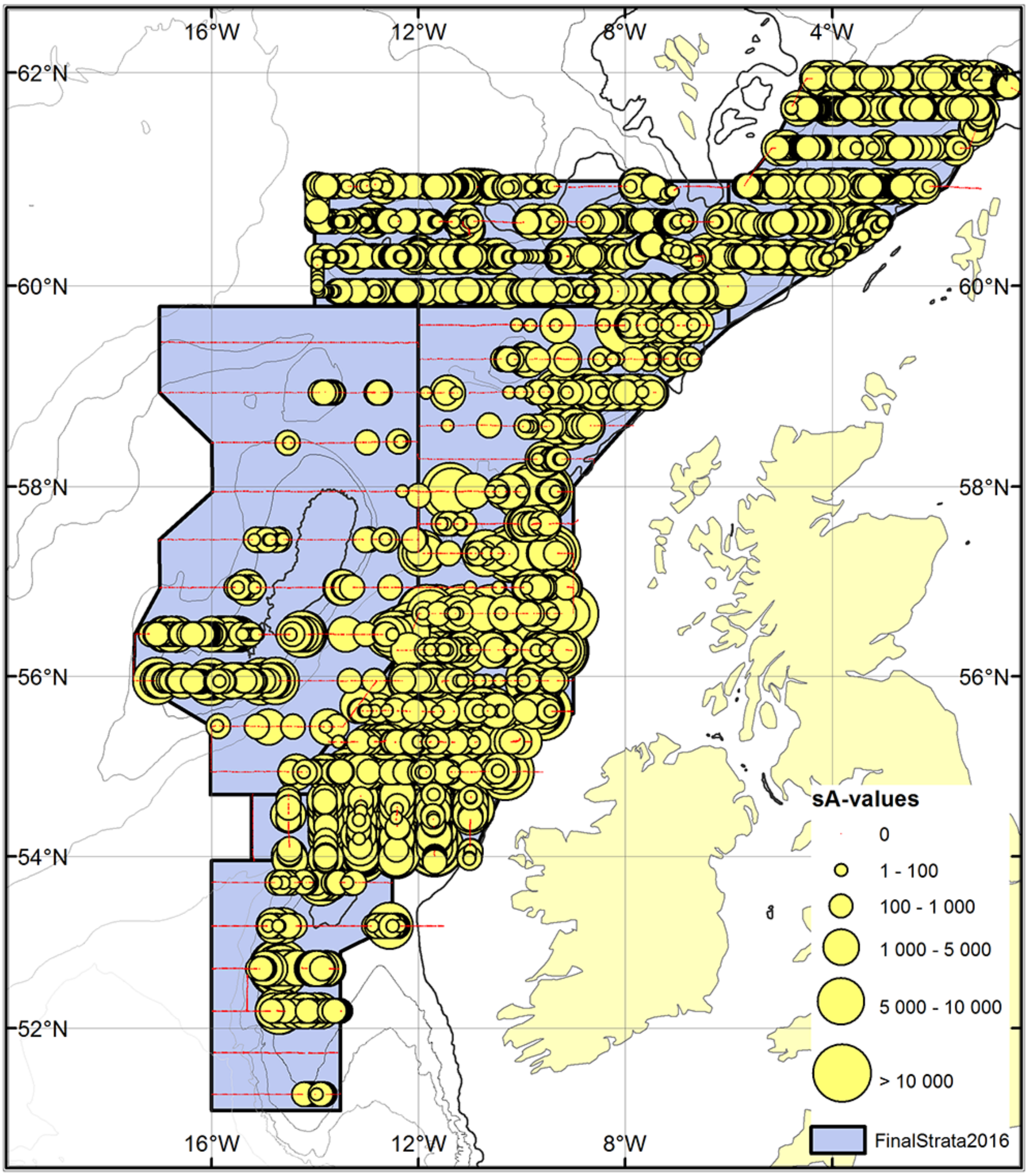
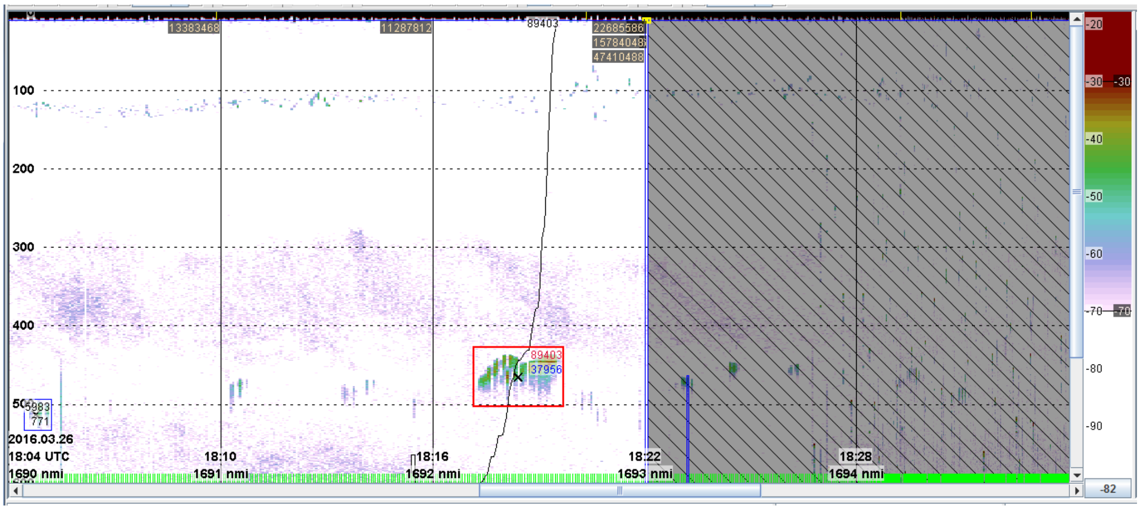
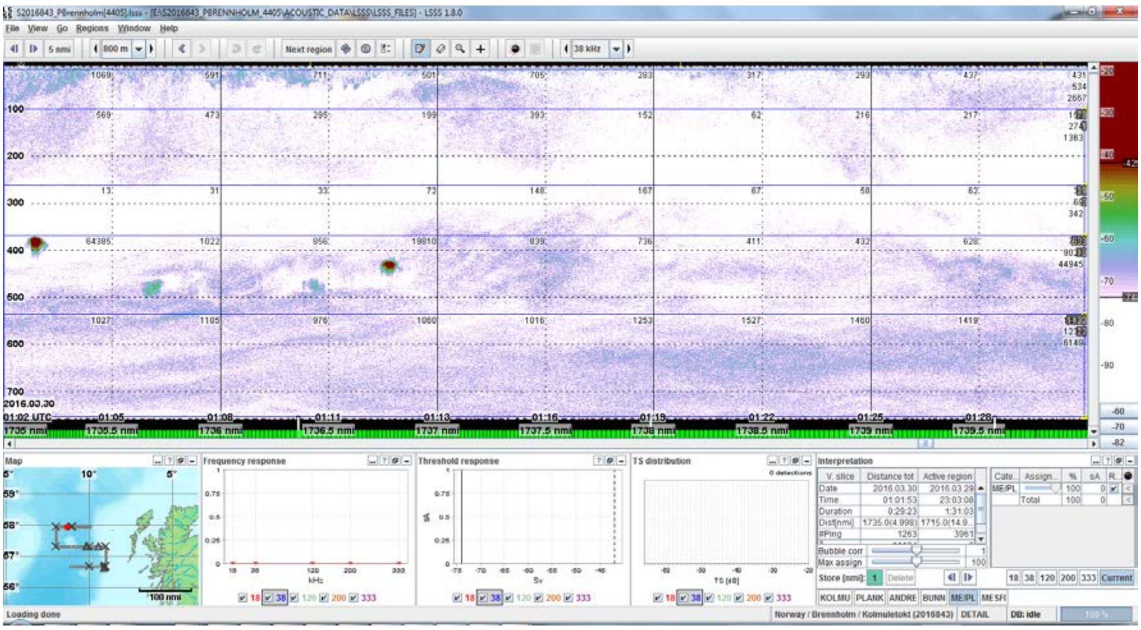


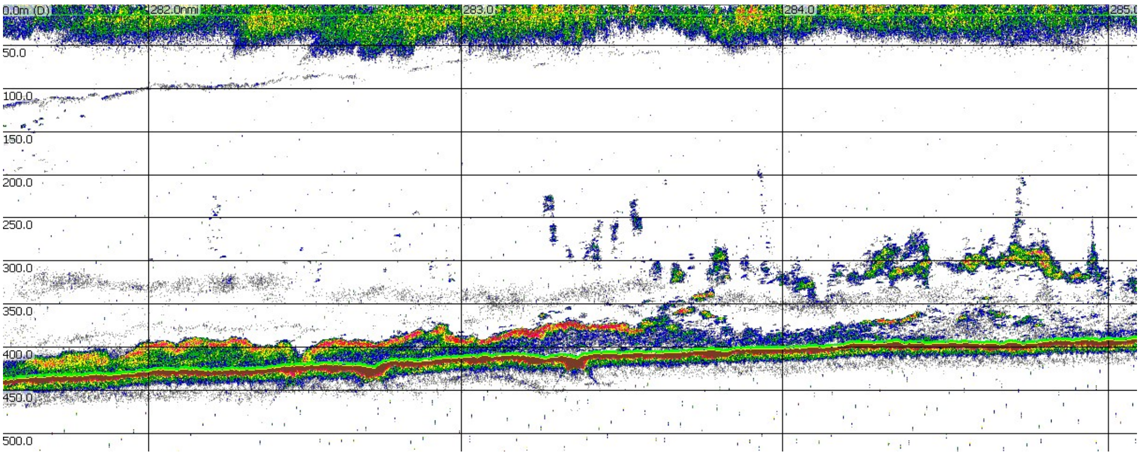
Figure 7. Map of acoustic density (s_A m^2/nmi^2) of blue whiting by 1 nmi (size of sircle represents acoustic density). IBWSS Macrch-April 2016.



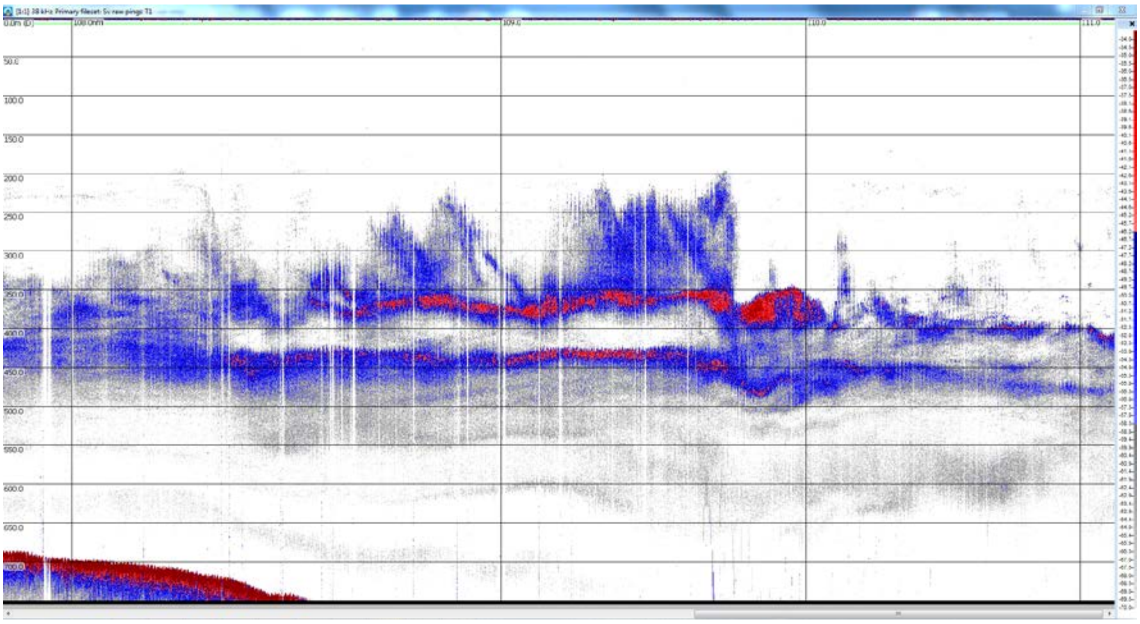
a) Very high density school of blue whiting registered by Tridens on the north Porcupine Bank close to the shelf slope.



b) Small very high density school of blue whiting registered by Brennholm in the Rockall Trough.



c) High density blue whiting registration in the southern Porcupine Bank (strata 1) recroded by the Celtic Explorer.



d) Medium dense layer of mainly immature blue whiting registered by Magnus Heinason in the northern strata (example due south of the "Munk", Faroes).

Figure 8. Echograms of interest encountered during the IBWSS, March-April 2016: a) Tridens b) Brennholm, c) Celtic Explorer, and d) Magnus Heinason.

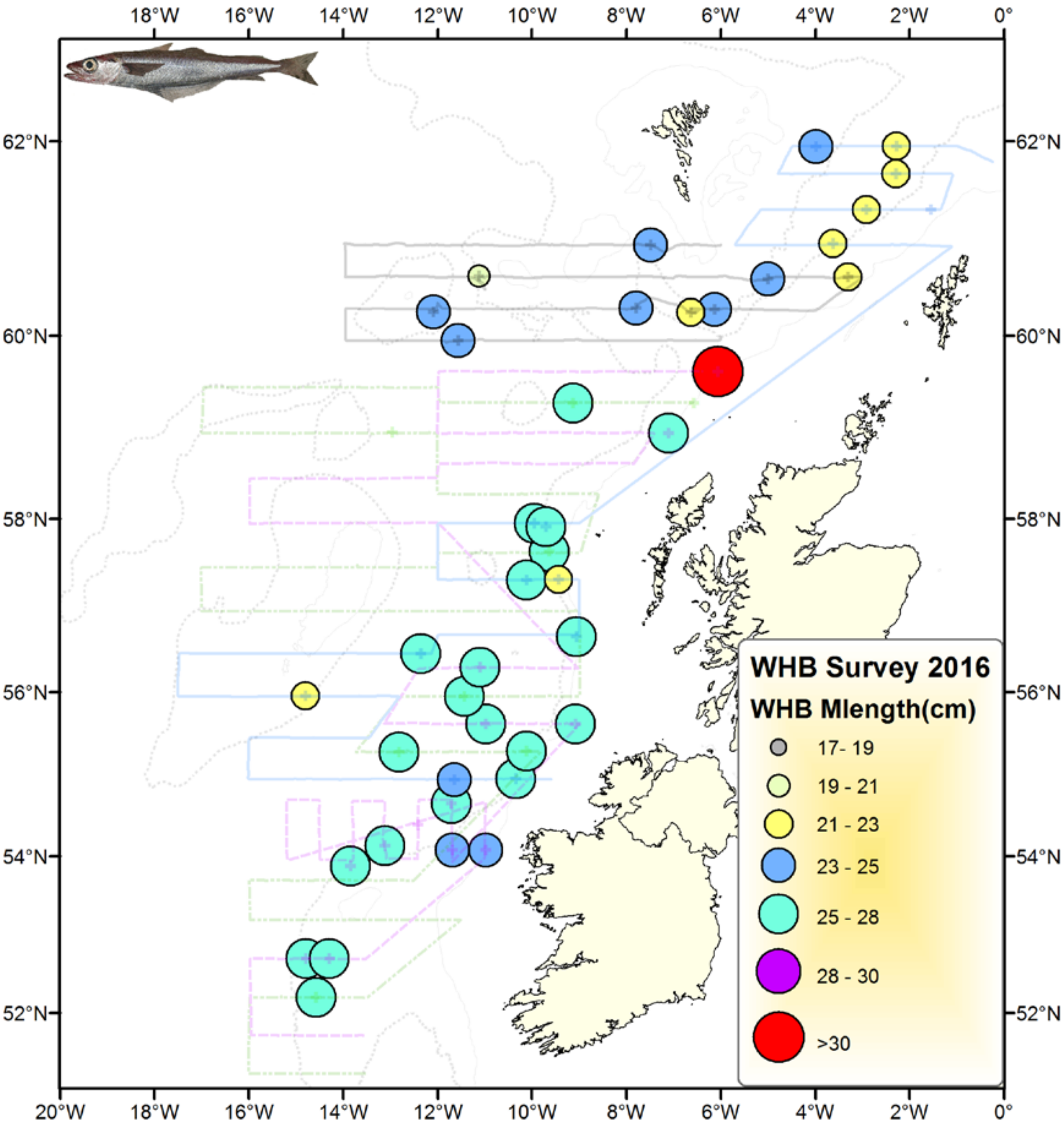


Figure 9. Combined mean length of blue whiting from trawl catches by vessel, IBWSS in March- April 2016. Crosses indicate hauls with zero blue whiting catches.

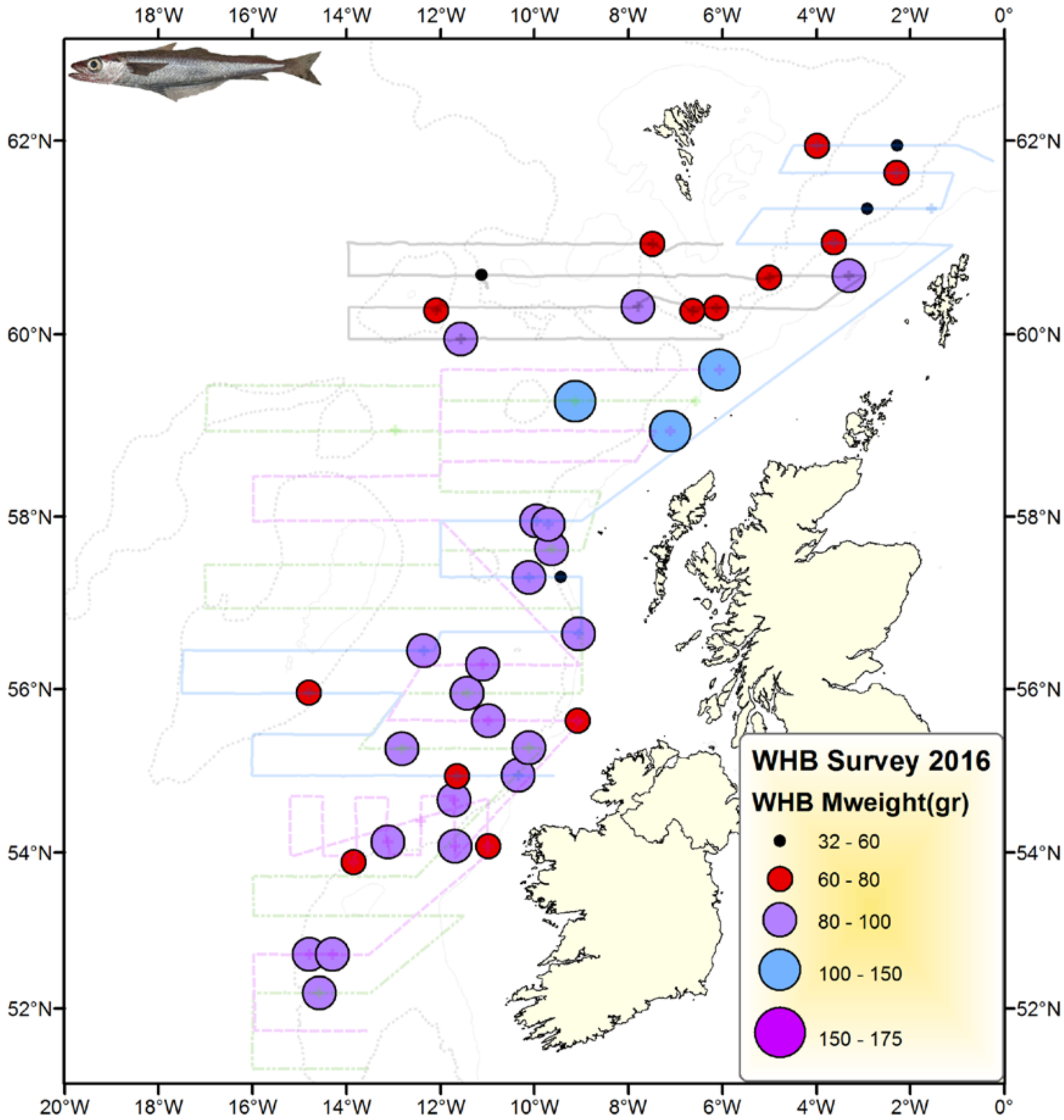


Figure 10. Combined mean weight of blue whiting from trawl catches,IBWSS March- April 2016. Crosses indicate hauls with zero blue whiting catches.

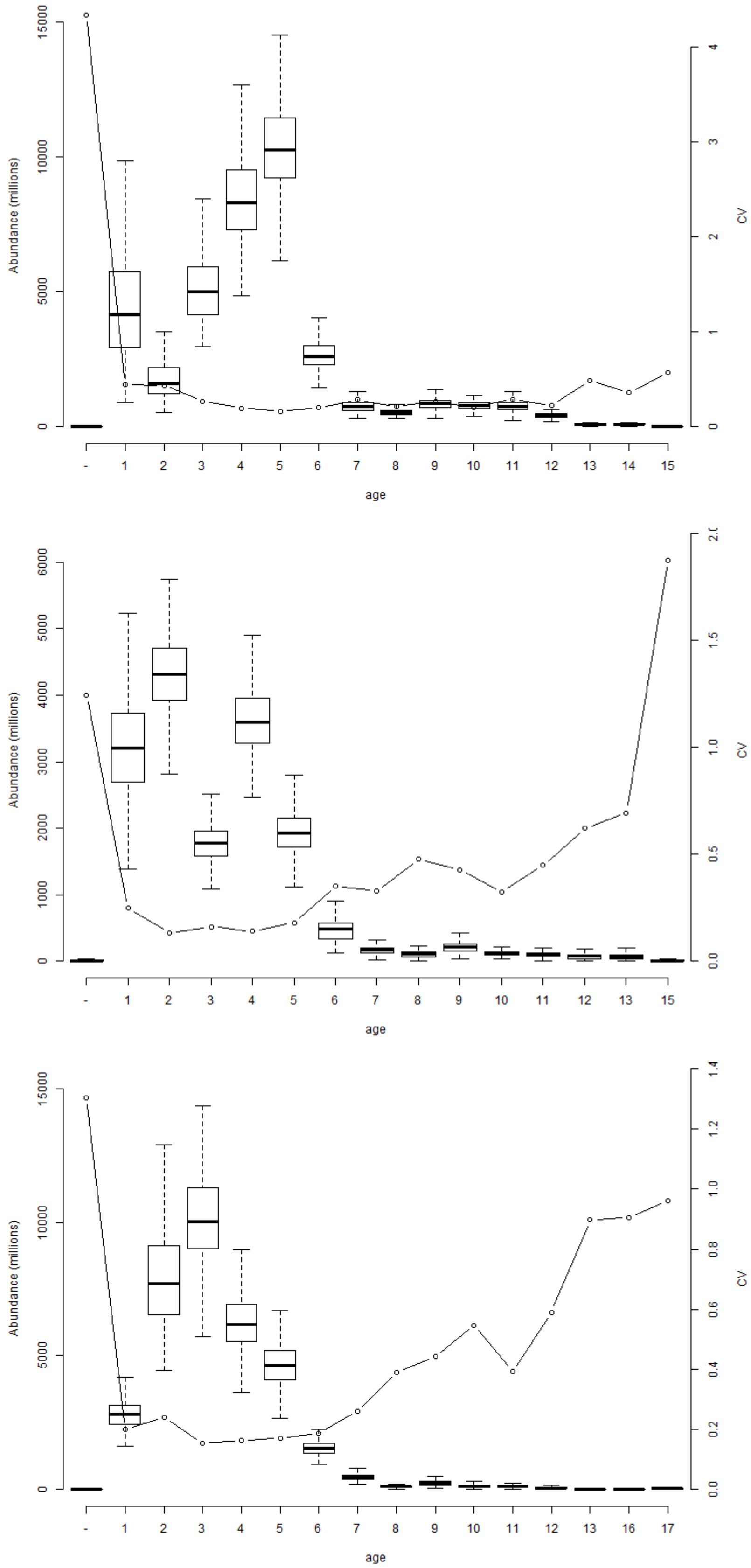


Figure 11. Blue whiting bootstrap abundance (millions) by age (left axis) and acociated CVs (right axis) in 2014 (top panel), 2015 (middle panel) and 2016 (lower panel). From StoX.

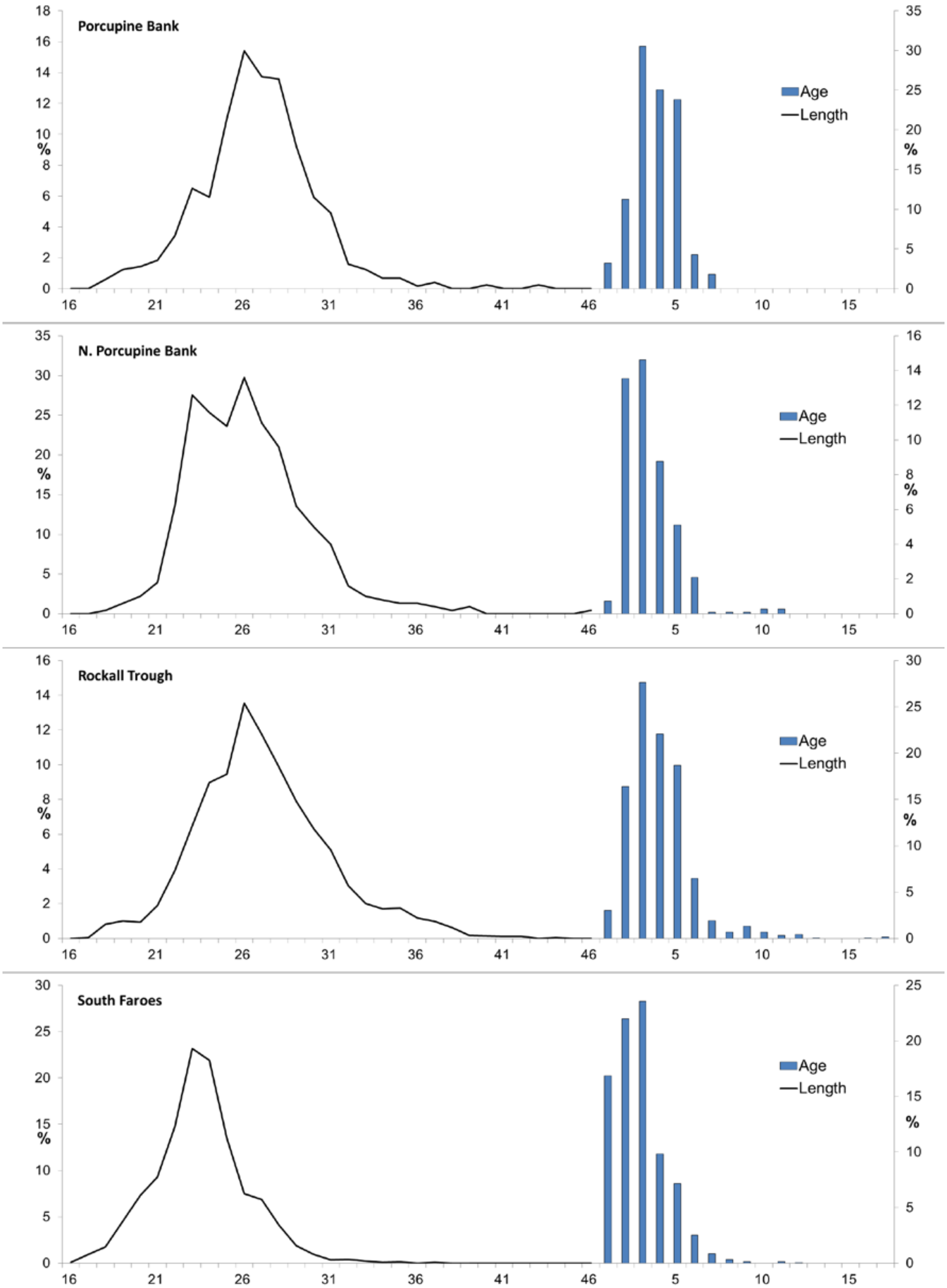


Figure 12. Length and age distribution (numbers) of blue whiting by covered strata, March-April 2016.

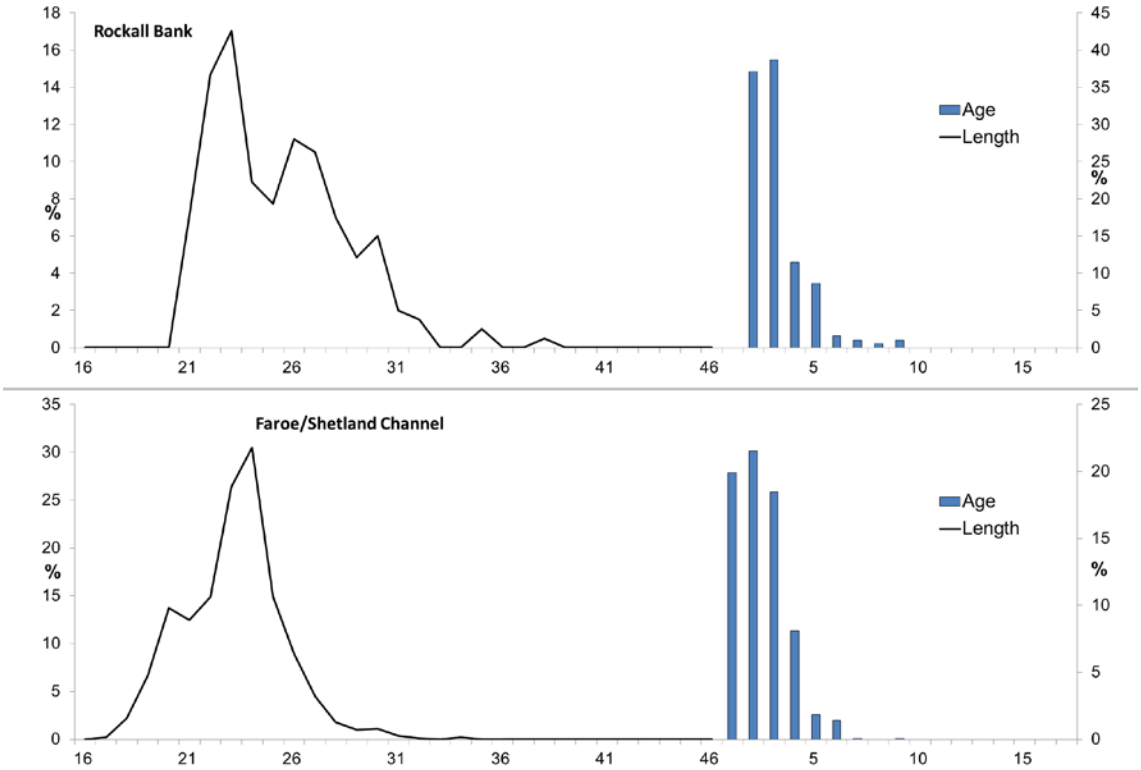


Figure 12 (continued). Length and age distribution (numbers) of blue whiting by covered strata, March-April 2016.

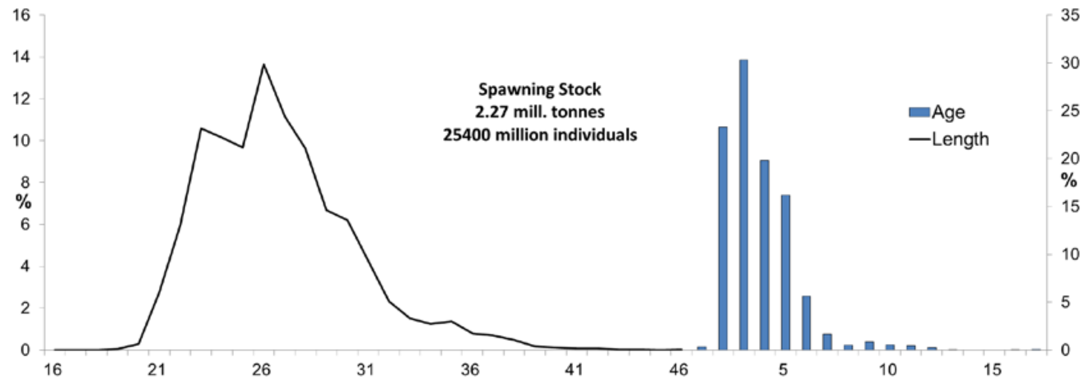


Figure 13. Length and age distributions (numbers) of total stock of blue whiting. Spawning stock biomass is given. March-April 2016.

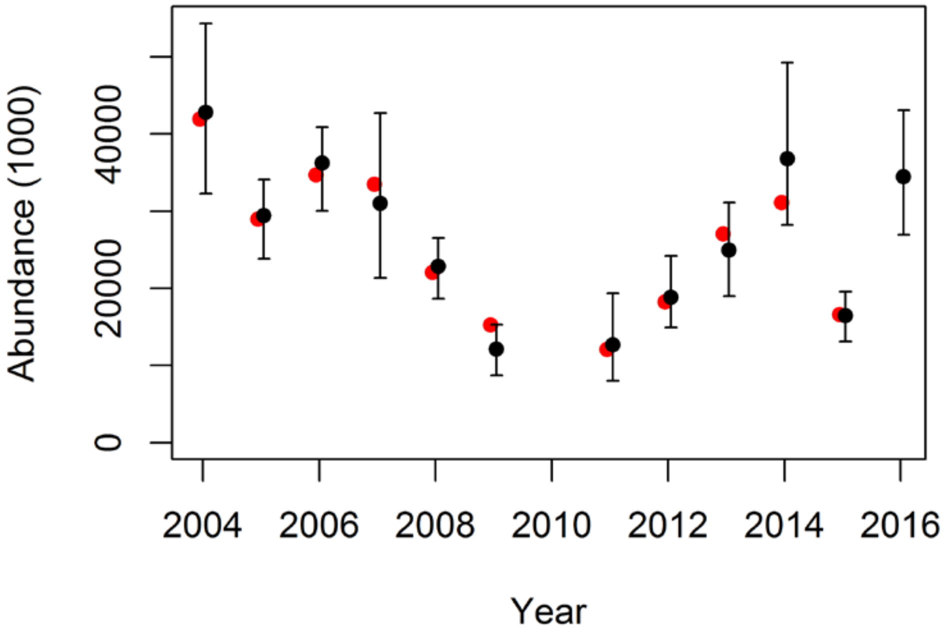


Figure 14. Time series comparison of StoX/BEAM packages for calculated blue whiting abundance.

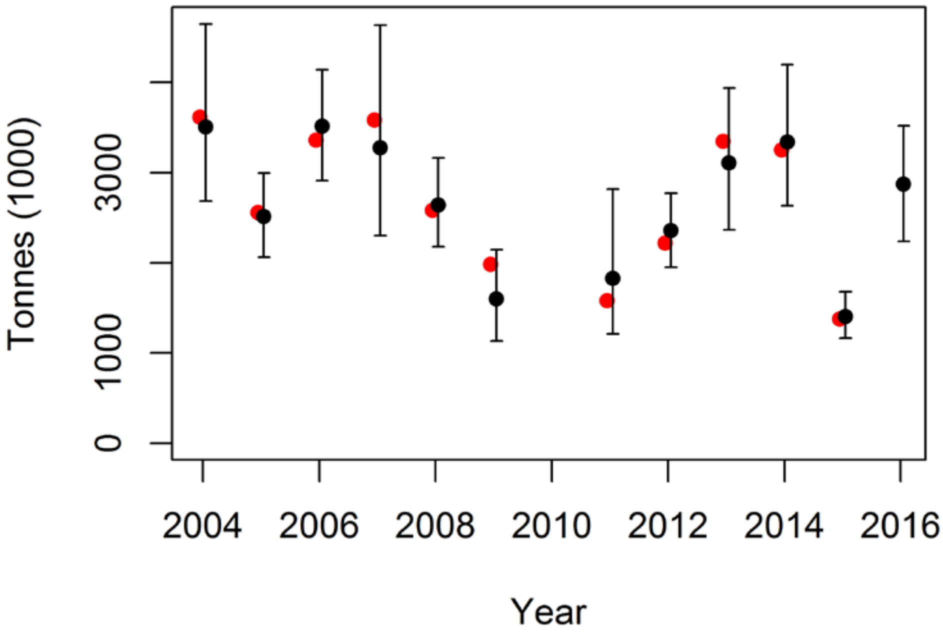


Figure 15. Time series comparison of StoX/BEAM packages for calculated blue whiting total biomass.

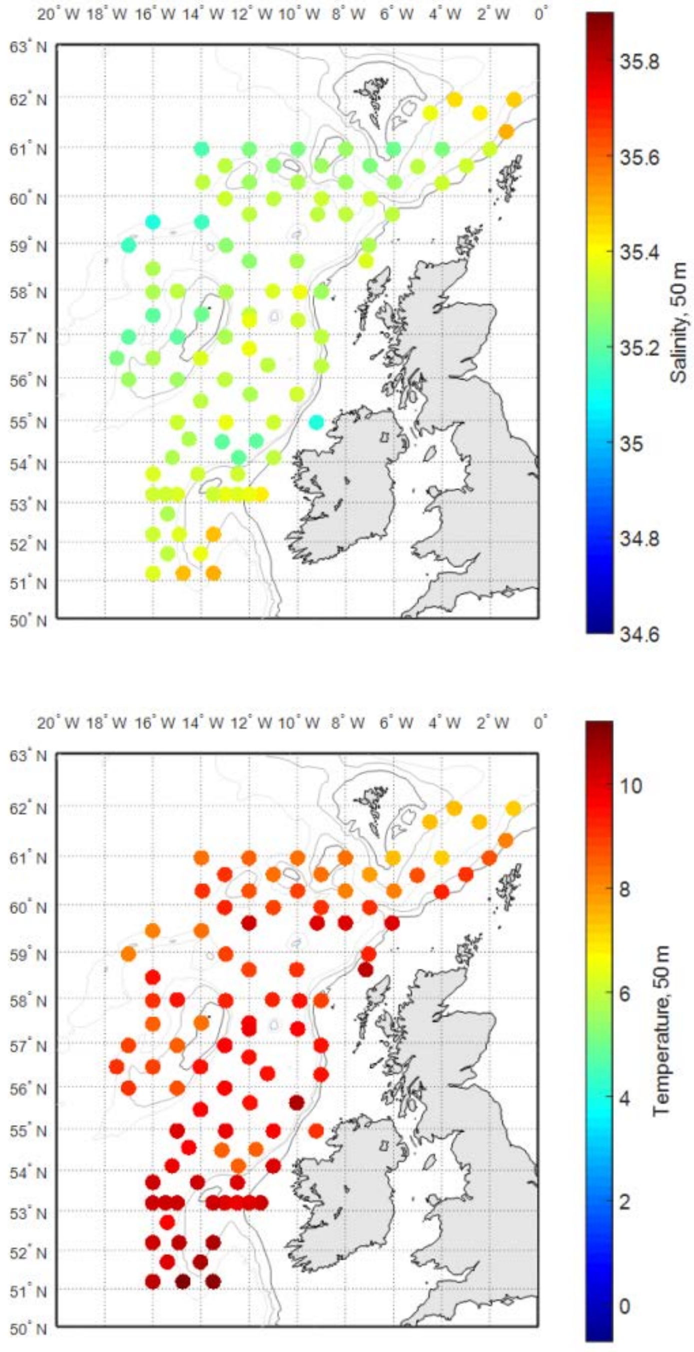


Figure 16. Horizontal temperature (top panel) and salinity (bottom panel) at 50 m subsurface as derived from vertical CTD casts. IBWSS March-April 2016.

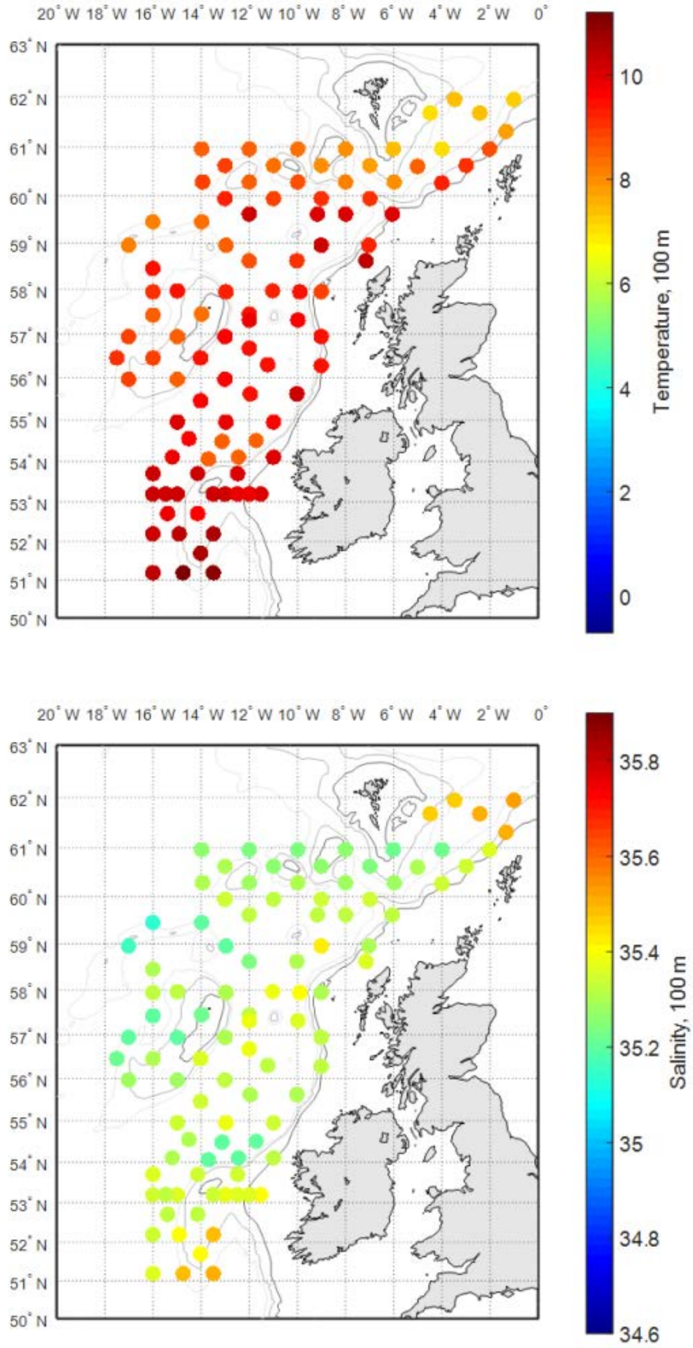


Figure 17. Horizontal temperature (top panel) and salinity (bottom panel) at 100 m subsurface as derived from vertical CTD casts. IBWSS March-April 2016.

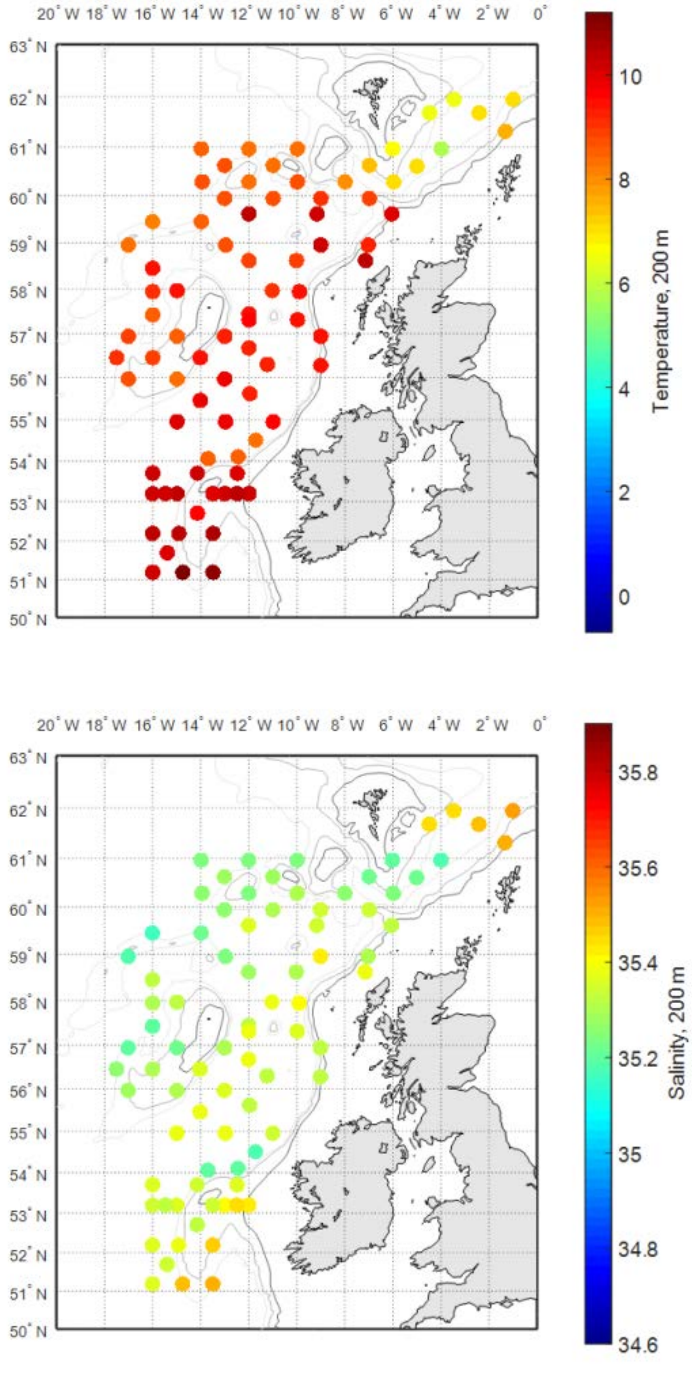


Figure 19. Horizontal temperature (top panel) and salinity (bottom panel) at 200 m subsurface as derived from vertical CTD casts. IBWSS March-April 2016.

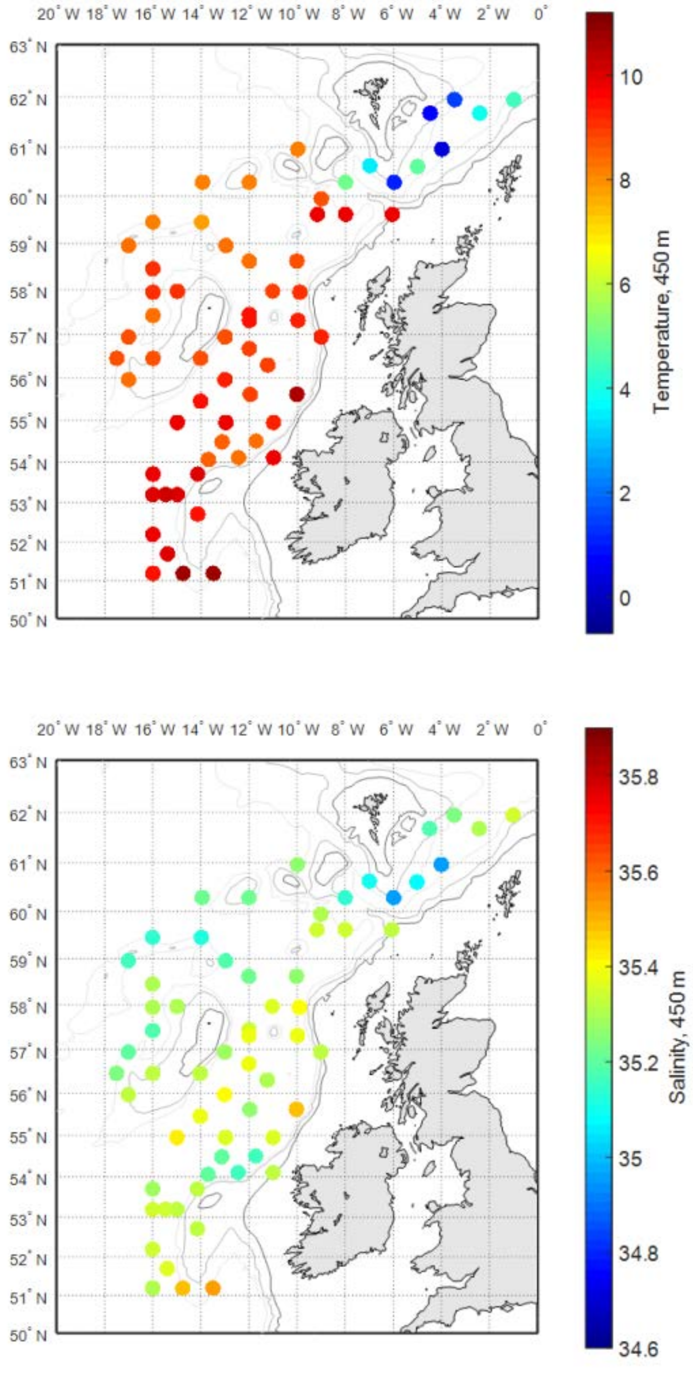


Figure 19. Horizontal temperature (top panel) and salinity (bottom panel) at 450 m subsurface as derived from vertical CTD casts. IBWSS March-April 2016.

Annex 4b: International Ecosystem Survey in the Nordic Seas (IESNS)

Survey Summary table	
Name of the survey (abbreviation):	IESNS
Summary: CruiseReport Link:http://hdl.handle.net/10793/	
Survey coverage was considered adequate in 2016 and in line with previous years. Due to rudder problems of one of the vessels (Johan Hjort), a commercial vessel (M. Ytterstad) had to be chartered to complete the northernmost transects. Due to this, the north-western stratum was not covered. However, for NSS herring the zero-line is believed to be reached for most of the survey area, and it is therefore recommended that the results can be used for assessment purpose. In general, the weather condition did not affect the survey even if there were some days that were not favorable and prevented for example WP2 sampling at some stations. The herring was primarily distributed in the central Norwegian Sea, with the highest densities observed in two aggregations separated at approximately 4°W and a third aggregation in the Jan Mayen area. Overall the herring density was relatively low. The total biomass estimate of herring in the Norwegian Sea was 5.4 million tonnes. This estimate is 0.4 million tonnes lower than in 2015. The herring stock is dominated by 3, 7 and 12 years old herring (year classes 2013, 2009 and 2004) in terms of numbers, with the 2004 contributing most to the biomass. The total biomass of blue whiting was 1.54 million tons, which is a 62% increase from the biomass estimate in 2015 (0.96). Age two is dominating the estimate. In the Barents Sea,the total herring abundance estimate was 1677 million individuals of age 1, 5463 million individuals of age 2, 1668 million individuals of age 3 and 103 million individuals of age 4. Survey effort, timing and coverage were comparable to previous years.	

	Description
Survey design	Stratified transect design with randomised start point in each stratum.
Index Calculation method	StoX (via the PGNAPES database)
Random/systematic error issues	Challenges related to allocation of backscatter to species in areas with mixed registrations of blue whiting and herring. Concern regarding differences in estimated strata specific age distribution between vessels.
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	NA, relatively good weather dominated the survey in 2016
Extinction (shadowing)	NA
Blind zone	Possible occurrence of herring above transducer depth
Dead zone	NA
Allocation of backscatter to species	Directed trawling for verification purposes
Target strength	Blue whiting: TS = 20 log(L) – 65.2 dB Herring: TS = 20.0 log(L) – 71.9 dB
Calibration	All survey frequencies calibrated and results within recommended tolerances

Working Document

Post-cruise meeting of the Working Group on International Pelagic Surveys (WGIPS)
IJmuiden, Netherlands, 21. – 23. June 2016

Working Group on Widely distributed Stocks
Copenhagen, Denmark, 31. August - 6. September 2016

INTERNATIONAL ECOSYSTEM SURVEY IN NORDIC SEA (IESNS) in May – June 2016

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RV Fridtjof Nansen

Valantine Anthonypillai[2], Are Salthaug[2], Åge Høines[2], Kjell Arne Mork[2], Webjørn Melle[2], Øystein Skagseth[2], Georg Skaret[2]
RV Johan Hjort and MS M. Ytterstad

Karl-Johan Stæhr[3], Bram Couperus[6,] Mathias Kloppmann[8]
RV Dana

Guðmundur J. Óskarsson[7], Héðinn Valdimarsson[7], Hildur Pétursdóttir[7]
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Eydna í Homrum[5], Ebba Mortensen[5], Poul Vestergaard[5], Jens Arni Thomassen[5], Leon Smith[5*]
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6 IMARES, IJmuiden, The Netherlands
7 Marine Research Institute, Reykjavik, Iceland
8 vTI-SF, Hamburg, Germany

Introduction

In May-June 2016, six research vessels; R/V Dana, Denmark (joined survey by Denmark, Germany, Ireland, The Netherlands, Sweden and UK), R/V Magnus Heinason, Faroe Islands, R/V Arni Friðriksson, Island, R/V Johan Hjort and M/S M. Ytterstad, Norway and R/V Fridtjof Nansen, Russia participated in the International ecosystem survey in the Nordic Seas (IESNS). The aim of the survey was to cover the whole distribution area of the Norwegian Spring-spawning herring with the objective of estimating the total biomass of the herring stock, in addition to collect data on plankton and hydrographical conditions in the area. The survey was initiated by the Faroes, Iceland, Norway and Russia in 1995. Since 1997 also the EU participated (except 2002 and 2003) and from 2004 onwards it was more integrated into an ecosystem survey. This report is compilation of data from this International survey stored in the PGNAPES databases and supported by national survey reports from each survey (Dana: Couperus, Staehr, Kloppmann 2016, Magnus Heinason: Homrum, Mortensen, FAMRI 1618-2016, Arni Friðriksson: Óskarsson 2016, Fridtjof Nansen: Rybakov PINRO 2016.

Material and methods

Coordination of the survey was done during the WGIPS meeting in January 2016. The participating vessels together with their effective survey periods are listed in the table below:

Vessel	Institute	Survey period
Dana	Danish Institute for Fisheries Research, Denmark	01/5–22/5
Johan Hjort	Institute of Marine Research, Bergen, Norway	02/5-24/5
M.Ytterstad	Institute of Marine Research, Bergen, Norway	03/6-09/6
Fridtjof Nansen	PINRO, Russia	05/5–30/5
Magnus Heinason	Faroe Marine Research Institute, Faroe Islands	05/5- 16/5
Arni Friðriksson	Marine Research Institute, Island	03/5-23/5

Figure 1 shows the cruise tracks and the CTD/WP-2 stations and Figure 2 the cruise tracks and the trawl stations. Survey effort by each vessel is detailed in Table 1. Frequent contacts were maintained between the vessels during the course of the survey, primarily through electronic mail.

In general, the weather condition did not affect the survey even if there were some days that were not favourable and prevented for example WP2 sampling at some stations.

The survey was based on scientific echosounders using 38 kHz frequency. Transducers were calibrated with the standard sphere calibration (Foote *et al.*, 1987) prior to the survey. Salient acoustic settings are summarized in the text table below.

Acoustic instruments and settings for the primary frequency (boldface).

	Dana	Johan Hjort	M.Ytterstad	Arni Friðriksson	Magnus Heinason	Fridtjof Nansen
Echo sounder	Simrad EK 60	Simrad EK 60	Simrad EK 60	Simrad EK60	Simrad EK60	Simrad EK60
Frequency (kHz)	**38**	**38**, 18, 120, 200	**38**, 18, 70, 120, 200	**38**, 18, 120, 200	**38**,200	**38,** 120
Primary transducer	ES38BP	ES 38B	ES 38B	ES38B	ES38B	ES38B
Transducer installation	Towed body	Drop keel	Drop keel	Drop keel	Hull	Hull
Transducer depth (m)	3	8.7	8	8	3	5.2
Upper integration limit (m)	5	15	15	15	7	10
Absorption coeff. (dB/km)	6.9	9.7	10	10	10.2	10
Pulse length (ms)	1.024	1.024	1.024	1.024	1.024	1.024
Band width (kHz)	2.425	2.425	2.43	2.425	2425	2.425
Transmitter power (W)	2000	2000	2000	2000	2000	2000
Angle sensitivity (dB)	21.9	21.9	21.9	21.9	21.9	21.9
2-way beam angle (dB)	-20.5	-20.6	-20.6	-20.9	-20.8	-20.6
Sv Transducer gain (dB)						
Ts Transducer gain (dB)	25.17	26.61	26.34	24.64	25.61	25.37
s_A correction (dB)	-0.55	-0.56	-0.65	-0.84	-0.64	-0.62
3 dB beam width (dg)						
alongship:	6.8	7.08	6.84	7.31	7.1	7.09
athw. ship:	6.8	7.08	6.88	6.95	7.08	7.08
Maximum range (m)	500	500	500	500	500	450
Post processing software	LSSS	LSSS	LSSS	LSSS	Sonardata Echoview 7.0	LSSS

Post-processing software differed among the vessels but all participants used the same post-processing procedure, which is according to an agreement at a PGNAPES scrutinizing workshop in Bergen in February 2009 (ICES 2009), and “Notes from acoustic Scrutinizing workshop in relation to the IESNS”, Reykjavík 3.-5. March 2015 (Annex 4 in ICES 2015a).

Generally, acoustic recordings were scrutinized with the different software (see table above) on daily basis and species identified and partitioned using catch information, characteristic of the recordings, and frequency between integration on 38 kHz and on other frequencies by a scientist experienced in viewing echograms. All vessels used a large or medium-sized pelagic trawl as the main tool for biological sampling. The salient properties of the trawls are as follows:

	Dana	Johan hjort	M.Ytterstad	Arni Friðriksson	Magnus Heinason	Fridtjof Nansen
Circumference (m)		832	832	832	640	500
Vertical opening (m)	25-35	45–50	45-50	30–35	45–55	50
Mesh size in codend (mm)		40	40	40	40	16
Typical towing speed (kn)	3.0-40	4.0–4.5	4.0-4.5	3.0–4.5	3.0–4.0	3.3–4.5

Catches from trawl hauls were sorted and weighed; fish were identified to species level, when possible, and other taxa to higher taxonomic levels. Normally a subsample of 30–100 herring and blue whiting were sexed, aged, and measured for length and weight, and their maturity status were estimated using established methods. An additional sample of 70–300 fish was measured for length.

Acoustic estimates of herring and blue whiting abundance were obtained during the surveys. This was carried out by visual scrutiny of the echo recordings using post-processing systems. The allocation of NASC-values to herring, blue whiting and other acoustic targets were based on the composition of the trawl catches and the appearance of echo recordings according to the agreed scrutinizing procedures (ICES 2009 and Annex 4 in ICES 2015a).

Acoustic data were analysed using the StoX software package recently adopted for WGIPS coordinated surveys. A description of StoX can be found here: http://www.imr.no/forskning /prosjekter/stox/nb-no. Estimation of abundance from acoustic surveys with StoX is carried out according to the stratified transect design model developed by Jolly and Hampton (1990). This method requires pre-defined strata, and the survey area was therefore split into 5 strata with pre-defined acoustic transects as agreed during the WGIPS in January 2016. Within each stratum, parallel transects with equal distances were used. The distance between transects was based on available survey time, and the starting point of the first transect in each stratum was randomized. This approach allows for robust statistical analyses of uncertainty of the acoustic estimates. The strata and transects used in StoX are shown in Figure 3. All trawl stations within a given stratum with catches of the target species (either blue whiting or herring) were assigned to all transects within the stratum, and the length distributions were weighted equally within the stratum.

The following target strength (TS)-to-fish length (L) relationships were used:

Blue whiting: $TS = 20 \log(L) - 65.2$ dB (ICES 2012)

Herring: $TS = 20.0 \log(L) - 71.9$ dB

The target strength for herring is the traditionally one used while this target strength for blue whiting was first applied in 2012 (ICES 2012).

In StoX a superindividual table is produced where abundance is linked to population parameters like age, length, weight, sex, maturity etc. (exact name: 1_FillMissingData_SuperIndividuals.txt). This table can be used to split the total abundance estimate by any combination of population parameters.

The hydrographical and plankton stations by survey are shown in Figure 1. Most vessels collected hydrographical data using a SBE 911 CTD (M. Ytterstad used a SAIV SD208 CTD). Maximum sampling depth was 1000 m.

Zooplankton was sampled by a WPII on all vessels except the Russian vessel which used a Djedi net, according to the standard procedure for the surveys. Mesh sizes were 180 or 200 µm. The net was hauled vertically from 200 m or the bottom to the surface. All samples were split in two and one half was preserved in formalin while the other half was dried and weighed. On the Danish, the Icelandic and the Norwegian vessels the samples for dry weight were size fractionated before drying. Data are presented as g dry weight per m^2. An average over all stations in the survey in Norwegian Sea (east of 14°W and west of 20°E) has been used to represent an inter-annual index of zooplankton abundance for the area in May. At WGINOR in 2015 (ICES, 2016), a new method was applied to obtain a time-series for four different areas. This method, where the zooplankton data were interpolated using objective analysis utilizing a Gaussian correlation function, was also applied on the 2016 data here. Thus, a new time-series are presented as well as comparison to the former one.

Stomach samples

Stomach samples from the three pelagic species (herring, blue whiting and mackerel) were collected by the Norwegian, Icelandic and Faroese vessels. These samples have however, not been analyzed yet and will be reported by other means later.

Results

Hydrography

<u>Temperature distribution for April-June 2016</u>

The temperature distributions in the ocean at 10m, 50m, 100, 200m and 400m depth are shown in Figures 4 and 5, and temperature averaged over selected depth intervals; 0-50 m, 50-200 m, and 200-500 m, are shown in Figures 6-8. The temperatures in the surface layer (0-50 m) ranged from 0°C in the Iceland and Greenland Sea to 9°C in the southern part of the Norwegian Sea (Fig. 6). The Arctic front was encountered slightly south of 65°N east of Iceland extending eastwards towards the 0° Meridian where it turned almost straight northwards around 70°N. The front was visible throughout the observed water column. The warmer North Atlantic water formed a broad tongue that stretched far northwards along the Norwegian coast with temperatures > 7 °C north to 71° N in the surface layers.

Relative to a 22 years long-term mean, from 1995 to 2016, the temperatures at all depths in the south, between Iceland and the Faroese, and in the south-eastern area were considerable lower in 2016 compared to the long-term mean (Figures 6-8). Largest negative anomaly was in the surface layer. There, the anomaly was maximum 1°C. North of about 70°N and western Norwegian Sea over the Mohns and Jan Mayen Ridges the temperatures at all depth were in general higher than the long-term mean. In these areas the temperatures were about 1 °C above the mean.

Temperature, salinity and density in the upper 800 m at the Svinøy section are shown in Figure 9. Atlantic water is lying over the colder intermediate layer and reach down to 600 m at shelf edge and down to 400 m depth further west. The warmest and saltiest waters are located at the shelf edge where the core of the inflowing Atlantic Water is located. Westward temperature and salinity are reduced due to mixing with colder and fresher waters. Relative to a long-term mean the temperatures in the eastern part of the section were lower in 2016 (Figure 10). There, the temperatures in the upper 400 m were about 0,5 °C lower than the long-term mean, which indicates colder and fresher inflowing Atlantic water than normal.

Zooplankton

Biomass of zooplankton dry weight at 0-200m at the sampling stations is shown in Figure 11, in comparison to the previous three years. Sampling stations were evenly spread over the area, and most oceanographic regions were covered. The zooplankton biomass was relatively uniform over the whole area, with the highest values off mid Norway and in the Iceland-Jan Mayen area. The index for zooplankton abundance for the Norwegian Sea (Lofoten Basin and S. Norwegian Sea) calculated with a Gaussian correlation function became 8.1 g dry weight m^{-2}, which is a slight increase from last year's value (Figure 12a).

The new index for zooplankton abundance in the Norwegian Sea in May is similar to the older index for most years, which represents the average dry weight of all samples in the area between 14°W and 20°E (Figure 12b).

In the Barents Sea (east of 20°E), the mean zooplankton biomass was 1.6 g dry weight m^{-2}. It was noted that the Djedy net applied by the Russian vessel in Barents Sea seems to be less effective in catching zooplankton in comparison to WP2 net applied by other vessels in an overlapping area. Thus, the biomass estimates for the Barents Sea are not directly comparable to the other areas, but are comparable among years within the Barents Sea.

Norwegian Spring-spawning herring

Survey coverage in the Norwegian Sea was considered adequate in 2016 and in line with previous years. Due to rudder problems of one of the participating vessels, the northwestern area was not covered (stratum 5), but for NSS herring the zero-line is believed to be reached for most of the area. It is therefore recommended that the results can be used for assessment purpose. The herring was primarily distributed in the central Norwegian Sea, with the highest densities observed in two aggregations separated at approximately 4°W and a third aggregation in the Jan Mayen area (Figure 13). Overall the herring density was relatively low. Registrations of NSS herring were low in the eastern part of the survey area – especially in stratum 2, except for some schools of young fish (mostly three year olds) near the boundary towards the Barents Sea.

As in previous years the smallest fish were found in the eastern area of the Norwegian Sea. This year young NSS herring were also caught in the Jan Mayen area. Size and age were found to increase to the west and south (Figure 14). Correspondingly, it was mainly older herring that appeared in the southwestern areas.

The herring stock is dominated by 3, 7 and 12 year old herring (year classes 2013, 2009 and 2004) in terms of numbers, with the 2004 contributing most to the biomass (Table 2). The four year classes from 2004, 2005, 2006 and 2009 contribute 17%, 10%, 10% and 13% respectively to the total biomass in the Norwegian Sea. The total number of herring recorded in the Norwegian Sea was 21.9 billion in 2016. Uncertainty estimates for numbers at age based on boostrapping with StoX are shown in Figure 21.

The total biomass estimate of herring in the Norwegian Sea from the 2016 survey was 5.4 million tonnes. This estimate is 0.4 million tonnes lower than in 2015. The biomass decreased from 2009 to 2012, but has been steady around 5 million tonnes 2013-2016 (Figure 15).

The abundance estimates of herring by age and length in the Barents Sea (Stratum 6) are shown in Table 3. The investigations of herring in the Barents Sea covered the area from 44°E to the 20°00´ E. The total abundance estimate was 1677 million individuals of age 1 (mean length of 10.7 cm and weight of 7.0 g), 5463 million individuals of age 2 (mean length of 16.1 cm and mean weight of 24.9 g), 1668 million individuals of age 3 herring (mean length of 22.1 cm and mean weight of 68.4 g) and 103 million individuals of age 4 herring (mean length of 26.3 cm and mean weight of 113.7 g). Only very few older herring were observed. Uncertainty estimates for numbers at age based on boostrapping with StoX are shown in Figure 22.

Blue whiting

The total biomass of blue whiting registered during the IESNS survey in 2016 was 1.54 million tons (Table 4), which is a 62% increase from the biomass estimate in 2015 (0.96). The stock estimate in number for 2016 is 20 billion, which is about 25% higher than in 2015. Age two is dominating the estimate (36% of the biomass and 40% by number). Uncertainty estimates for numbers at age based on boostrapping with StoX are shown in Figure 23. The distribution of blue whiting in 2016 was similar to the years before, with high abundance estimates in the eastern and southern part of the Norwegian Sea, along the Norwegian continental slope, as well as south of Iceland. The main concentrations were observed both in connections with the continental slopes of Norway and south of Iceland and in the open sea in the southern part of the Norwegian Sea (Figure 16). The largest fish were found in the western and northern part of the survey area. Mean length of blue whiting is shown in Figure 17. It should be noted that the spatial survey design was not intended to cover the whole blue whiting stock during this period and also that due to the lack of coverage in stratum 5 the zero line for blue whiting in the north was not reached.

Relationship with temperature

The distribution of the pelagic fish stocks is apparently linked to the temperature within the distribution area as shown on profiles of the two transects across the whole Norwegian Sea (Figure 18). For example, the herring was not found in surface waters (0-100m) in waters colder than 3°C as in the western part of the Norwegian Sea, even if found in colder waters deeper down. Blue whiting was on the other hand limited to waters warmer than around 2°C.

Mackerel

During the last ten years an increasing amount of mackerel has been observed in the catches during the May survey. Figure 19 indicates that the distribution did not extend further to the north after 2014. Also, after 2014, no mackerel was found in the catches in the area between Faroe Islands and Iceland.

It should be noted, however, that the acoustic survey is not designed to monitor mackerel. The species is not scrutinized during the survey. Trawling data should be treated with care, as the trawl speed is relatively low for mackerel. Also, the distribution of catches containing mackerel may be influenced by its vertical distribution and differences in trawling of the individual research vessels. In addition differences in catch quantities between years may be caused by changes in trawling gears.

Discussion

Hydrography

Discussions related to the oceanographic condition in April/June 2016 are provided in the results section above, while more general patterns are introduced in this section.

Two main features of the circulation in the Norwegian Sea, where the herring stock is grazing, are the Norwegian Atlantic Current (NWAC) and the East Icelandic Current (EIC). The NWAC with its offshoots forms the northern limb of the North Atlantic current system and carries relatively warm and salty water from the North Atlantic into the Nordic Seas. The EIC, on the other hand, carries Arctic waters. To a large extent this water derives from the East Greenland Current, but to a varying extent, some of its waters may also have been formed in the Iceland and Greenland Seas. The EIC flows into the southwestern Norwegian Sea where its waters subduct under the Atlantic waters to form an intermediate Arctic layer. While such a layer has long been known in the area north of the Faroes and in the Faroe-Shetland Channel, it is only in the last three decades that a similar layer has been observed all over the Norwegian Sea.

This circulation pattern creates a water mass structure with warm Atlantic Water in the eastern part of the area and more Arctic conditions in the western part. The NWAC is rather narrow in the southern Norwegian Sea, but when meeting the Vøring Plateau off Mid Norway it is deflected westward. The western branch of the NWAC reaches the area of Jan Mayen at about 71°N. Further northward in the Lofoten Basin the lateral extent of the Atlantic water gradually narrows again, apparently under topographic influence of the mid-ocean ridge. It has been shown that atmospheric forcing largely controls the distribution of the water masses in the Nordic Seas. Hence, the lateral extent of the NWAC, and consequently the position of the Arctic Front, that separates the warm North Atlantic waters from the cold Arctic waters, is correlated with the large-scale distribution of the atmospheric sea level pressure.

Plankton

The zooplankton biomass index for Norwegian Sea in May has been estimated since 1995 but the time-series was re-evaluated by WGINOR in 2015 by utilizing a new approach (ICES 2016a; Figure 12a). Over the years from 1995-2002 the plankton index was relatively high even if varying between years. From 2003-2006, the index decreased continuously and has been at relatively low levels since then even if a slight increase can be noted throughout the period. This general pattern applies more or less to all the different sub-areas within the Norwegian Sea (Figure 12a).

The reason for this fluctuation in the zooplankton biomass is not obvious to us. The unusually high biomass of pelagic fish feeding on zooplankton has been suggested to be one of the main causes for the reduction in zooplankton biomass. However, carnivorous zooplankton and not pelagic fish are the main predators of zooplankton in the Norwegian Sea (Skjoldal *et al.*, 2004), and we do not have good data on the development of the carnivorous zoo-plankton stocks.

The mean zooplankton biomass index in Barents Sea (east of 20°E) was 1.6 g dry weight m^{-2}, or twice the index for 2015 (0.80 g m^{-2}) but comparable to the years 2014, 2013 and 2012 (1.6, 1.5 and 1.7 g dry weight m^{-2}, respectively). As stated above, the biomass estimates for the Barents Sea taken with the Djedi net are not directly comparable to the other areas taken by WP2 nets, but are comparable among years within the Barents Sea. Also, it must be noted that the 2015 survey in Barents Sea was two weeks later than normally.

Summing up, the reason for the observed changes in zooplankton biomass is not clear to us and more ecological and environmental researches to reveal this are recommended. Quantitative researches on carnivorous zooplankton stocks (such as krill and amphipods) across the whole survey area, is an important step in that direction and needs a further effort by all participating countries.

Norwegian spring-spawning herring

The Norwegian spring-spawning herring is characterized by large dynamics with regard to migration pattern. This applies to wintering, spawning and feeding area. The following discussion will mainly concentrate on the distribution and situation in the feeding areas in May, but no attempt was done to draw up the likely feeding migration that is believed to be comparable to recent years.

The total biomass of herring measured in the 2016 survey in the Norwegian Sea was 7.3% lower than in 2015 (Figure 15). When considering the confidence interval of the indices the difference is less pronounced because of wider confidence interval in 2015. Furthermore, it shows that the 2016 estimate at similar level as the estimates from 2012-2014.

The approach of dividing the survey area into strata, which was used in 2014 for the first time, and this year's application of StoX instead of BEAM is considered as valid improvements in terms of securing equivalent coverage among years, tracking how the estimates were derived and allowing for robust statistical analyses of uncertainty of the acoustic estimates.

In the last two years (2014 and 2015) there were concerns regarding age reading of herring, because the age distributions from the different participants showed differences. For example, there was an apparent difference in the age distribution in Stratum 4 between the Icelandic and the Norwegian vessel with respect to age groups 10-12 years, which might be a consequence of a "drift" of 2004 year class into the 2003 and 2005 year classes during the ageing. However, the differences might also reflect differing spatial distribution of age groups, and partly, they may reflect variable growth conditions for the stock, and consequently growth rate as seen on the fish scales and otoliths. These concerns were the motivation for an age estimation workshop in Bergen in November 2015 (ICES 2016b). Both scales and otoliths from the same fish had been sampled for this purpose. The results showed a low level of agreement (52%) between age readings and a general trend appeared where the scales were estimated to be one year older than the otoliths. This leads to an apparent loss of the strong year class of 2004. After reviewing the structures in plenary, it was clear that it was most often the first winter ring in the scale which was not clearly visible in the otoliths. However, the conclusion of the age reading workshop was that the different ages obtained from scale and otoliths readings could be due to a number of issues relating to identification of the first winter ring and age interpretation of older fish, confounded by stock mixing issues. Furthermore, they recommended that the sampling and stock mixing issues should be addressed separately by WGWIDE. With respect to these results, and the concerns in the recent two years, the comparison between the nations in this year's survey showed some different results (Figure 20). The 2004 year class was in higher proportion by the Icelandic and Faroese readers than the Norwegian readers in Stratum 3 and 4, or the other way around than in recent years. We have no simple explanation for this.

In the 2016 IESNS there were no apparent discrepancies in the acoustic scrutinizing results between any neighbouring vessels like observed in the previous two surveys. Hence, there was no reason to revisit the acoustic data and the scrutinizing work during the post-cruise meeting.

Blue whiting

The abundance estimate of blue whiting in the IESNS survey 2016 showed a significant increase from the last years and the biomass estimate has increased even more and this increase is mainly because the dominating year class has grown to be one year older. A positive sign in development of the stock size was first observed in the 2011 survey where blue whiting at age 1 and 2 were in higher numbers than the previous years. This year, the number of 1 year old blue whiting was lower than last year, but still in the high end compared to previous years. The result from last year with a strong 2014 year class was confirmed with the two year olds as the most dominant year class in this year's survey (Table 4).

General recommendations and comments

RECOMMENDATION	ADRESSED TO
1. Continue the methodological research in distinguishing between Herring and blue whiting in the interpretation of echograms.	WGIPS

Next years post-cruise meeting

13-15 June 2017. Location will be decided at the next WGIPS meeting.

Concluding remarks

- Relative to a 21 years long-term mean, the temperatures was lower in the far south (-0.5°C), and higher (+0.5°C) in the remainder of the area.
- The 2016 index of meso zooplankton biomass in the Norwegian Sea is still relatively low when compared to the reference period from 1995-2016, particularly in the western most areas.
- The biomass estimate of NSSH in 2016 was 7.3 % lower compared to last year. The survey in the Norwegian Sea followed the pre-planned protocol and there are no obvious methodological reasons for the decrease in the biomass estimate of NSS-herring from the 2015 survey. The biomass is comparable in size to the estimates from 2012 to 2015. The survey group recommends using this estimate in the assessment.
- NSSH was dominated by the 2013, 2009 and 2004 year class in numbers, with the 2004 year class as main contributor to the biomass.
- No strong year classes of NSSH were observed in the Barents Sea indicating poor recruitment since 2004.
- The biomass of blue whiting measured in the 2016 survey area was 62 % higher compared to last year and by number 25% higher than in 2015.
- Age 2 (2014 ycl) blue whiting is dominating the acoustic estimate (36% of the biomass and 40% by numbers).

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Tables

Table 1. Survey effort by vessel for the International ecosystem survey in the Nordic Seas in May - June 2016.

Vessel	Effective survey period	Effective acoustic cruise track (nm)	Trawl stations	Ctd stations	Aged fish (HER)	Length fish (HER)	Plankton stations
Dana	1/5-22/5	2061	33	34	443	2488	34
Magnus heinason	5/5-14/5	1097	11	19	369	603	17
Árni Fridriksson	4/5-21/5	3086	30	43	1064	3575	47
Johan Hjort	3/5-23/5	2146	45	65	639	2220	72
M. Ytterstad	4/6-8/6	782	11	14	79	302	14
Fridtjof Nansen	7/5-25/5	3145	30	78	252	256	76
Total		**12317**	**160**	**253**	**2846**	**9444**	**260**

Table 2. IESNS 2016 in the Norwegian Sea. Estimates of abundance, mean weight and mean length of Norwegian spring-spawning herring.

	age																			
LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
5-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	603	603	-	-
19-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5054	5054	293.1	58.00
20-21	10614	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10614	737.7	69.50
21-22	14330	11176	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25506	2092.7	82.05
22-23	-	149253	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	149253	13522.9	90.60
23-24	6033	432039	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	438073	47804.0	109.12
24-25	-	781206	24963	-	-	-	-	-	-	-	-	-	-	-	-	-	-	806169	96997.2	120.32
25-26	19122	886239	23579	-	-	-	-	-	-	-	-	-	-	-	-	-	-	928941	120589.5	129.81
26-27	24813	584818	221435	15508	-	9305	-	-	-	-	-	-	-	-	-	-	-	855880	124513.0	145.48
27-28	-	457558	455274	50871	-	-	-	-	-	-	-	-	-	-	-	-	-	963704	151679.0	157.39
28-29	-	141596	308129	401909	32792	27327	-	-	-	-	-	-	-	-	-	-	-	911752	159383.0	174.81
29-30	-	59406	282477	500081	181323	127661	57193	-	-	-	-	-	-	-	-	-	-	1208141	225846.3	186.94
30-31	-	25740	90888	449364	388344	175926	113207	35329	-	-	-	-	-	-	-	-	-	1278796	259766.2	203.13
31-32	-	19682	71873	308347	148641	207028	225851	58087	2447	27820	12237	44054	-	-	-	-	-	1126067	255283.2	226.70
32-33	-	-	25652	234778	253015	314457	85974	27984	13079	28319	25652	-	18248	-	-	-	-	1027156	253266.6	246.57
33-34	-	-	2104	169972	280074	534152	38100	81354	12824	49794	27277	34866	25149	-	-	-	-	1255666	336666.9	268.12
34-35	-	-	1617	81863	222117	718667	104633	211290	413873	228168	383650	28489	63641	-	-	-	-	2458008	708290.1	288.16
35-36	-	-	-	2685	188710	494935	189267	449764	636240	789944	1189574	201196	54352	-	-	-	-	4196666	1277261.0	304.35
36-37	-	-	-	-	56179	66588	97731	216803	576059	499631	841984	370261	203873	24050	51276	2074	-	3006509	964119.9	320.68
37-38	-	-	-	-	27659	6498	16595	60778	93777	176018	331720	201018	66556	35897	966	-	-	1017481	341689.3	335.82
38-39	-	-	-	-	-	-	-	1849	21267	51645	58384	49480	7397	7397	9247	-	-	206666	75101.9	363.40
39-40	-	-	-	-	-	-	-	-	-	-	6797	-	-	-	5562	-	-	12359	4506.9	364.66
TSN(1000)	74913	3548714	1507991	2215377	1778853	2682543	928550	1143238	1769566	1851338	2877275	929365	439216	67344	67051	2074	5658	21889065	-	-
TSB(1000 kg)	8978.7	474005.0	258165.2	460003.0	432317.8	704894.6	244226.4	335717.8	549787.9	567083.9	905342.8	294113.5	137966.9	23957.6	21854.5	701.8	293.1	-	5419410.5	-
Mean length (cm)	23.82	25.32	28.07	30.28	32.28	33.22	32.97	34.76	35.39	35.45	35.56	35.87	35.66	36.89	36.60	36.00	17.95	-	-	-
Mean weight (g)	119.85	133.57	171.20	207.64	243.03	262.77	263.02	293.66	310.69	306.31	314.65	316.47	314.12	355.75	325.94	338.30	58.00	-	-	247.59

Table 3. IESNS 2016 in the Barents Sea. Estimates of abundance, mean weight and mean length of Norwegian spring-spawning herring.

LenGrp	age 1	2	3	4	5	Number (1E3)	Biomass (1E3kg)	Mean W (g)
8-9	35813	-	-	-	-	35813	125.3	3.50
9-10	167872	-	-	-	-	167872	895.3	5.33
10-11	530474	-	-	-	-	530474	3006.0	5.67
11-12	835742	-	-	-	-	835742	6602.4	7.90
12-13	107438	-	-	-	-	107438	1092.3	10.17
14-15	-	434228	-	-	-	434228	7421.3	17.09
15-16	-	1709855	-	-	-	1709855	36020.9	21.07
16-17	-	1819779	-	-	-	1819779	45059.3	24.76
17-18	-	1204843	-	-	-	1204843	37331.3	30.98
18-19	-	294052	-	-	-	294052	10249.8	34.86
19-20	-	-	34435	-	-	34435	1566.8	45.50
20-21	-	-	152155	-	-	152155	8026.2	52.75
21-22	-	-	360368	-	-	360368	21762.2	60.39
22-23	-	-	733550	-	-	733550	51541.5	70.26
23-24	-	-	304311	-	-	304311	24192.7	79.50
24-25	-	-	83285	-	41643	124928	11389.2	91.17
26-27	-	-	-	68870	-	68870	7386.3	107.25
27-28	-	-	-	34435	-	34435	4356.1	126.50
TSN(1000)	1677338	5462758	1668104	103306	41643	8953148	-	-
TSB(1000 kg)	11721.3	136082.8	114043.8	11742.4	4434.9	-	278025.2	-
Mean length (cm)	10.68	16.07	22.11	26.33	24.50	-	-	-
Mean weight (g)	6.99	24.91	68.37	113.67	106.50	-	-	31.05

Table 4. IESNS 2016 in the Norwegian Sea. Estimates of abundance, mean weight and mean length of blue whiting.

	age																				
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
16-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2283	2283	-	-
17-18	121097	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121097	3191.5	26.35
18-19	575602	65737	-	4219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	645559	20479.0	31.72
19-20	1091856	286293	54210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1432359	53848.8	37.59
20-21	1317851	370668	210227	2979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1901725	83977.5	44.16
21-22	776849	938389	317077	16489	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2048805	106237.4	51.85
22-23	271617	1804132	485448	7424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2568620	159185.4	61.97
23-24	61744	2237791	926111	63241	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3288886	235931.2	71.74
24-25	6534	1485763	961558	147752	20323	-	-	-	-	-	-	-	-	-	-	-	-	-	2621930	210395.0	80.24
25-26	-	713500	564608	168230	50984	22214	14516	-	-	-	-	-	-	-	-	-	-	-	1534052	139891.4	91.19
26-27	-	152287	346502	345846	86450	33728	4188	-	-	-	-	-	-	-	-	-	-	-	969002	103860.2	107.18
27-28	-	24154	179532	245841	171375	100961	6128	14778	3695	-	-	-	-	-	-	-	-	-	746465	90909.0	121.79
28-29	-	10423	131255	247424	165250	73067	21161	19833	7933	-	-	-	-	-	-	-	-	-	676347	91731.1	135.63
29-30	-	-	33323	200807	130232	77461	52949	18910	3782	17019	-	-	-	-	-	-	-	-	534484	81355.8	152.21
30-31	-	-	-	34272	206434	27378	93508	32570	-	-	-	-	-	-	-	-	-	-	394163	65916.0	167.23
31-32	-	-	-	27438	58285	37254	25269	21836	10410	-	-	-	-	-	-	6246	-	-	186739	34932.5	187.07
32-33	-	-	-	5380	28380	24021	11362	14840	21200	-	5764	-	-	-	-	-	-	-	110947	22185.9	199.97
33-34	-	-	-	-	-	-	7583	7583	-	11352	-	-	-	-	-	-	-	-	26519	5118.3	193.01
34-35	-	-	-	-	2235	8624	4469	-	5783	2235	5749	-	-	-	5783	-	1928	-	36806	8656.9	235.21
35-36	-	-	-	-	-	1286	-	22501	1286	-	12759	2900	-	-	-	-	-	-	40733	10658.1	261.66
36-37	-	-	-	-	-	-	-	5050	2864	-	5050	12876	-	-	-	-	-	-	25841	7095.6	274.58
37-38	-	-	2695	-	-	2695	4248	1348	1348	2900	-	-	3865	5801	-	-	-	-	24900	7447.0	299.08
38-39	-	-	-	-	-	-	9578	-	-	-	-	-	-	-	-	-	-	-	9578	2937.4	306.67
39-40	-	-	-	-	-	-	3208	-	-	-	-	-	-	-	-	-	-	-	3208	904.6	282.00
42-43	-	-	-	-	-	-	-	2900	-	-	-	-	-	-	-	-	-	-	2900	1035.5	357.00
TSN(1000)	4223151	8089138	4212548	1517342	919948	408690	258168	162151	58301	33507	29323	15777	3865	5801	5783	6246	1928	2283	19953948	-	-
TSB(1000 kg)	180464.3	549964.0	337163.3	177962.8	130827.8	60454.4	44018.5	30429.3	11559.7	6767.1	8046.9	4434.6	1047.4	1418.3	1617.3	1315.8	389.4	-	-	1547881.0	-
Mean length (cm)	19.84	22.77	23.80	26.75	28.50	28.71	30.31	31.20	31.60	31.58	34.70	35.98	37.50	37.00	34.00	31.33	34.50	16.25	-	-	-
Mean weight (g)	42.73	67.99	80.04	117.29	142.21	147.92	170.50	187.66	198.28	201.96	274.43	281.08	271.00	244.50	279.67	210.67	202.00	-	-	-	77.58

Figures

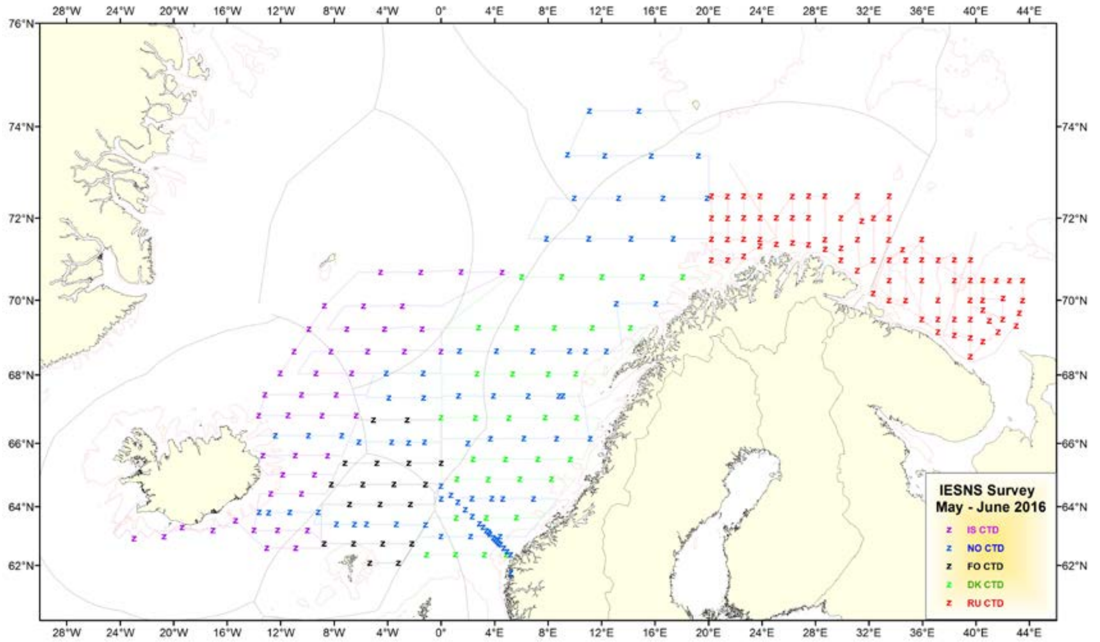

Figure 1. Cruise tracks and CTD stations by country for the IESNS survey in May-June 2016.

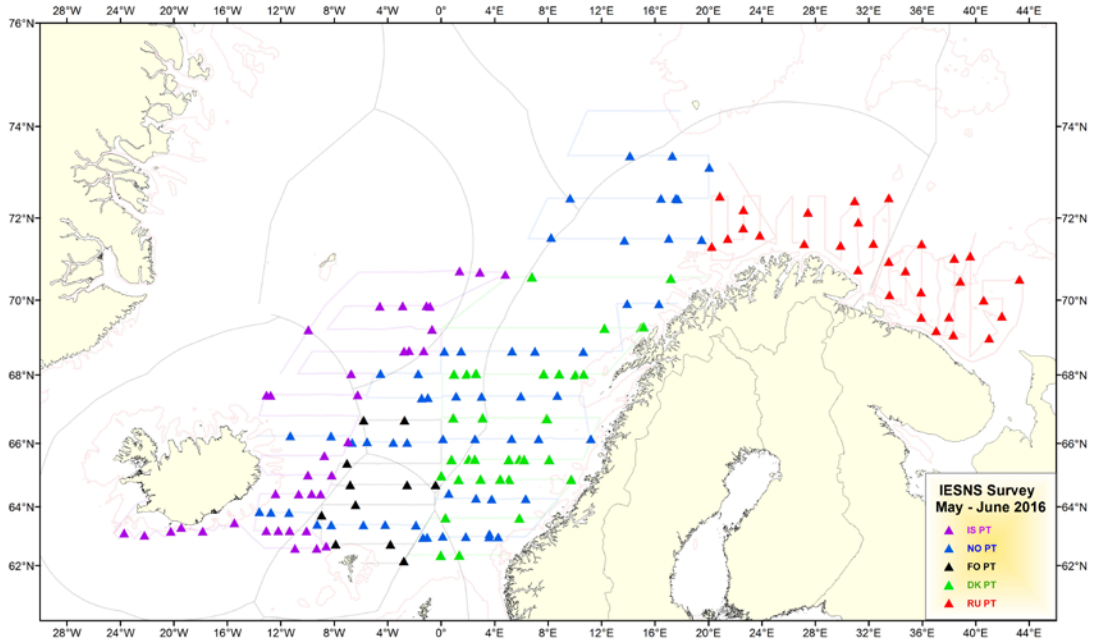

Figure 2. Cruise tracks during the IESNS survey in May-June 2016 and location of trawl stations (both for fish and macro zooplankton).

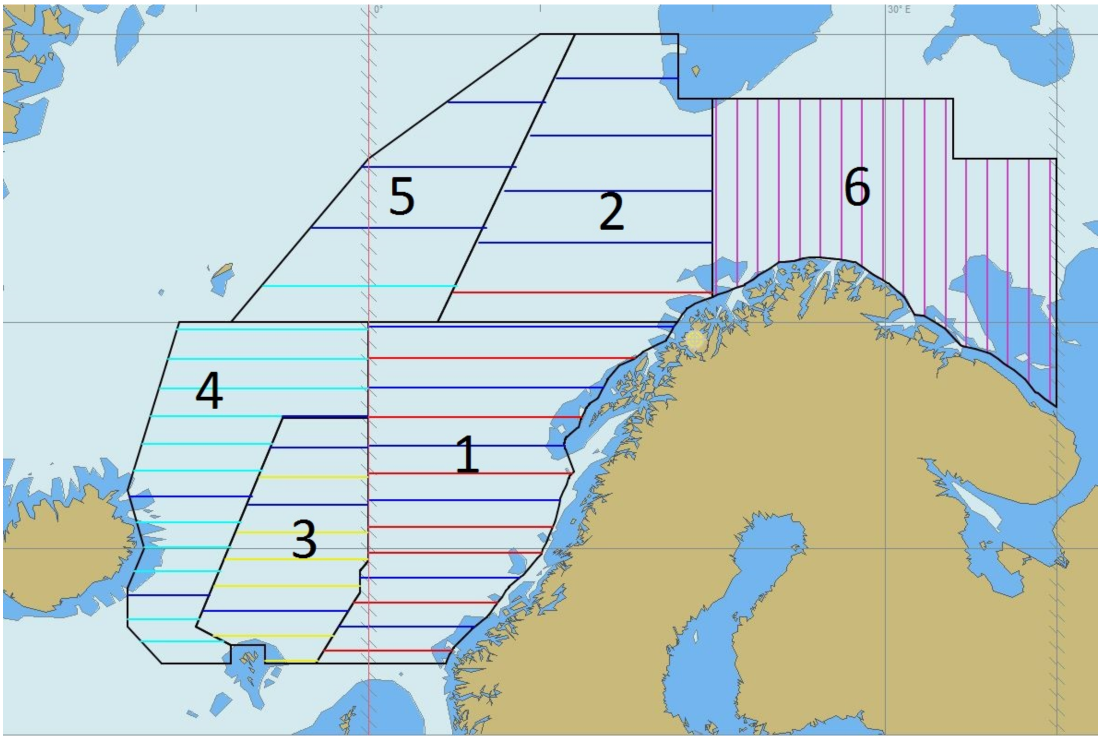

Figure 3. The pre-planned strata and transects for the IESNS survey in 2016 (red: EU, dark blue: Norway, yellow: Faroes Islands, violet: Russia, light blue: Iceland).

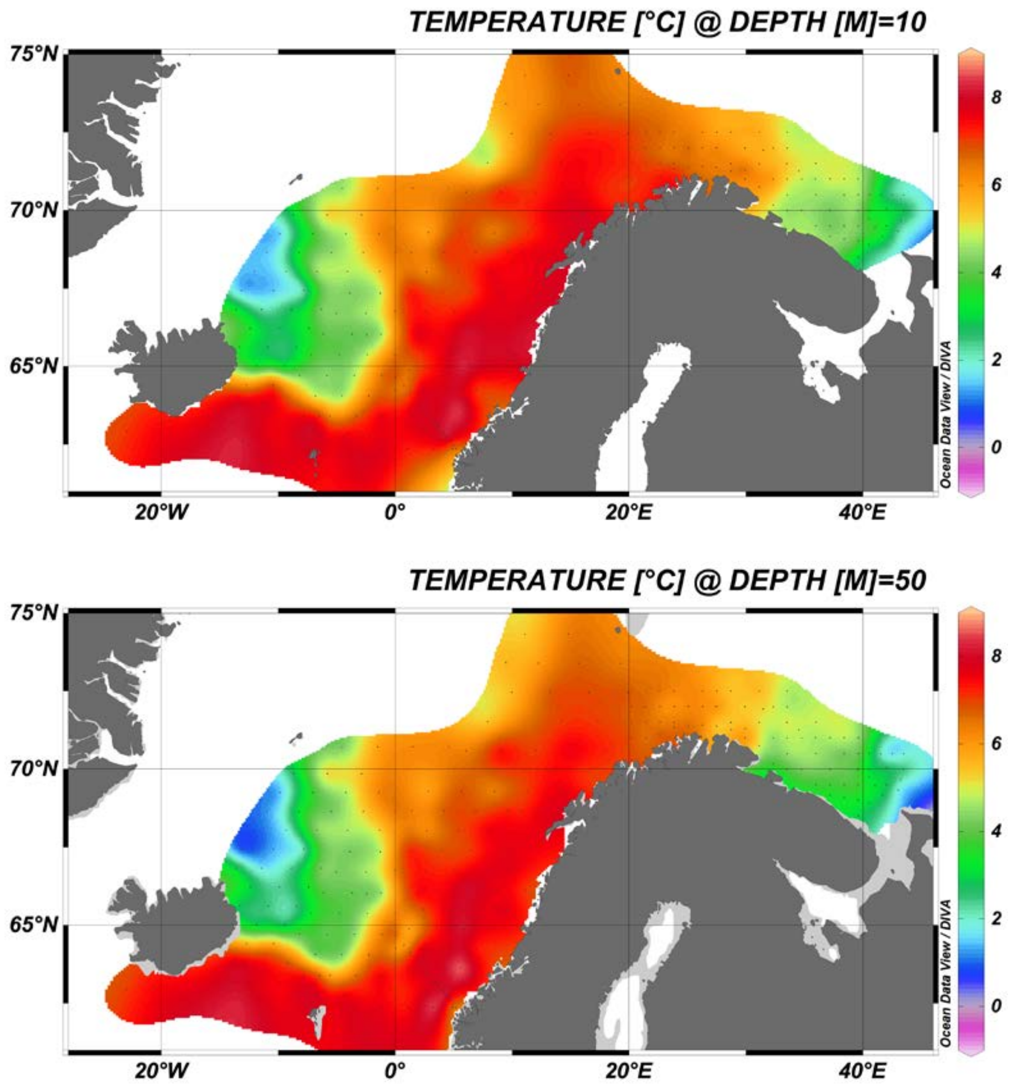

Figure 4. The horizontal distribution of temperatures at 10 m (surface) and 50 m depth in May-June 2016.

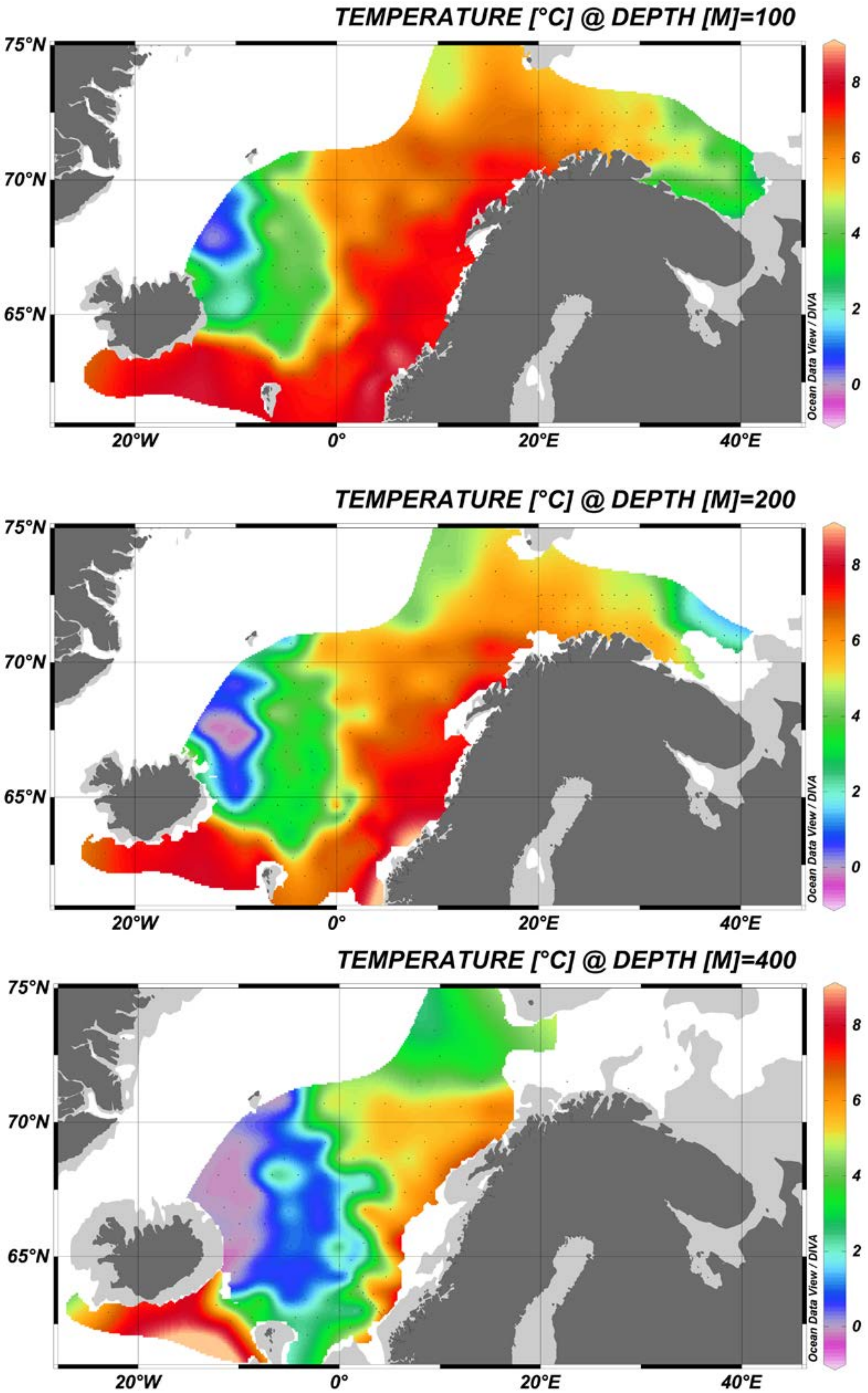

Figure 5. The horizontal distribution of temperatures at 100, 200 and 400 m depth in May-June 2016.

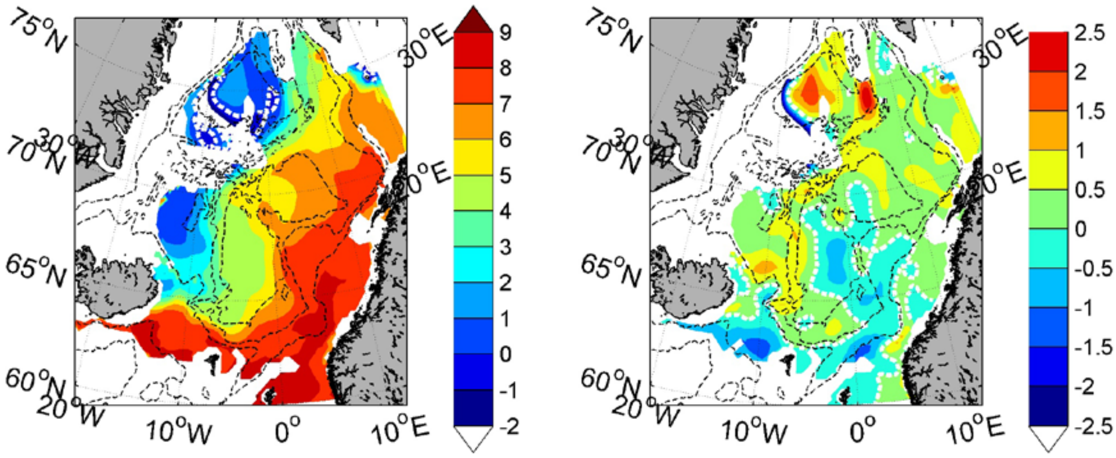

Figure 6. Temperature (left) and temperature anomaly (right) averaged over 0-50 m depth. Anomaly is relative to the 1995-2015 mean.

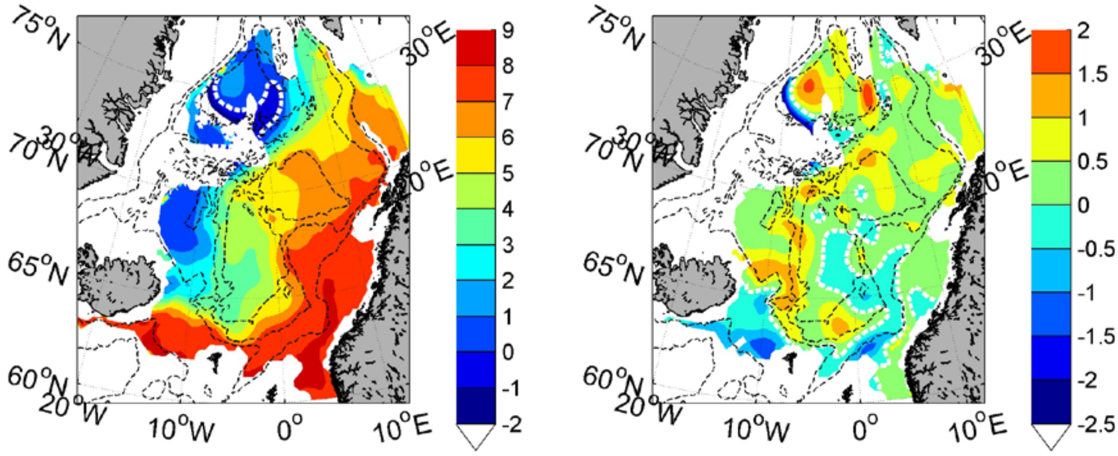

Figure 7. Temperature (left) and temperature anomaly (right) averaged over 50-200 m depth. Anomaly is relative to the 1995-2015 mean.

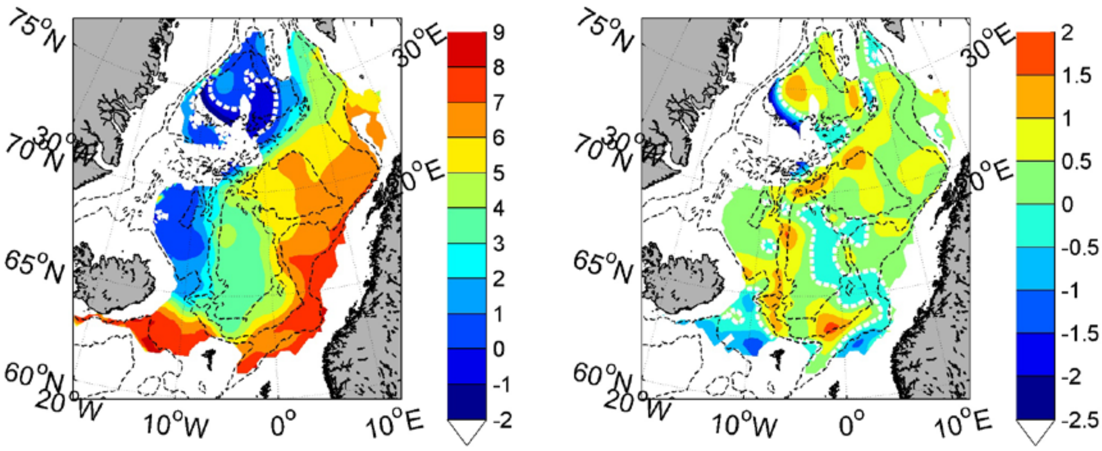

Figure 8. Temperature (left) and temperature anomaly (right) averaged over 200-500 m depth. Anomaly is relative to the 1995-2015 mean.

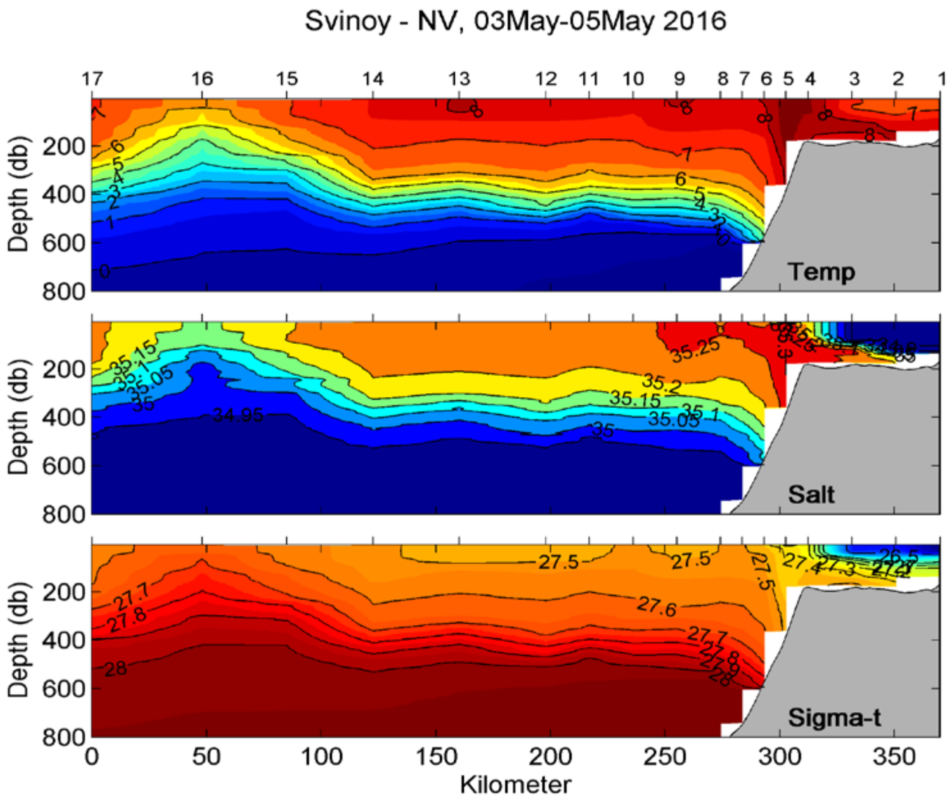

Figure 9. Temperature, salinity, density (sigma-theta) in the Svinøy section, May 2016.

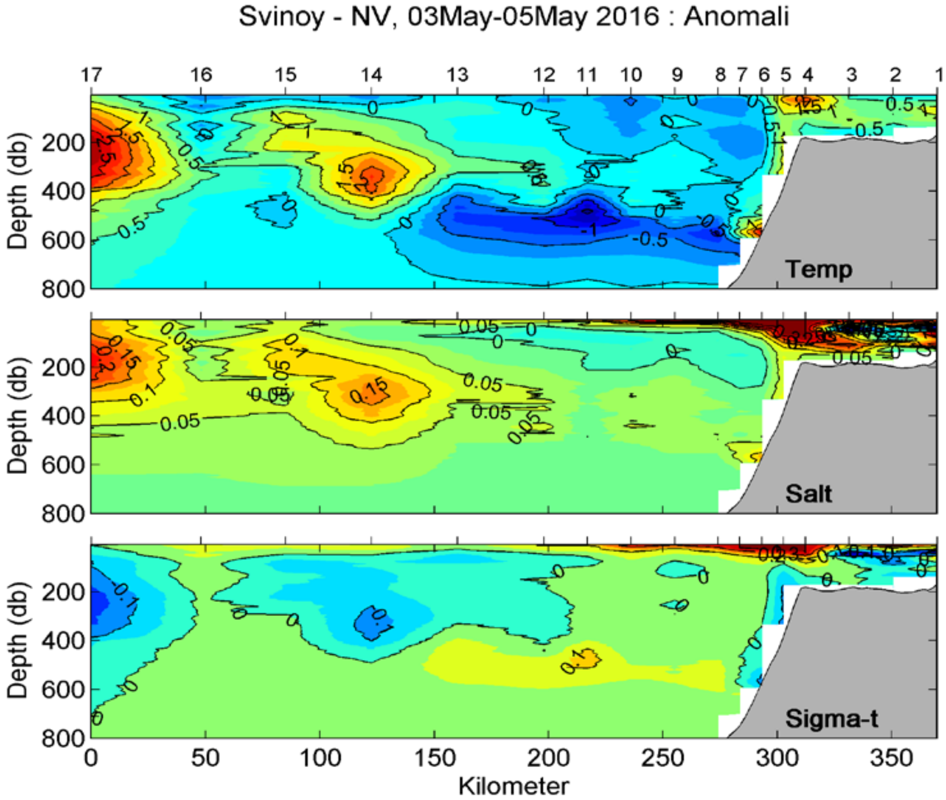

Figure 10. Temperature, salinity, density (sigma-theta) anomaly in the Svinøy section, May 2016. Anomalies are relative to a 30 years long-term mean (1978-2007).

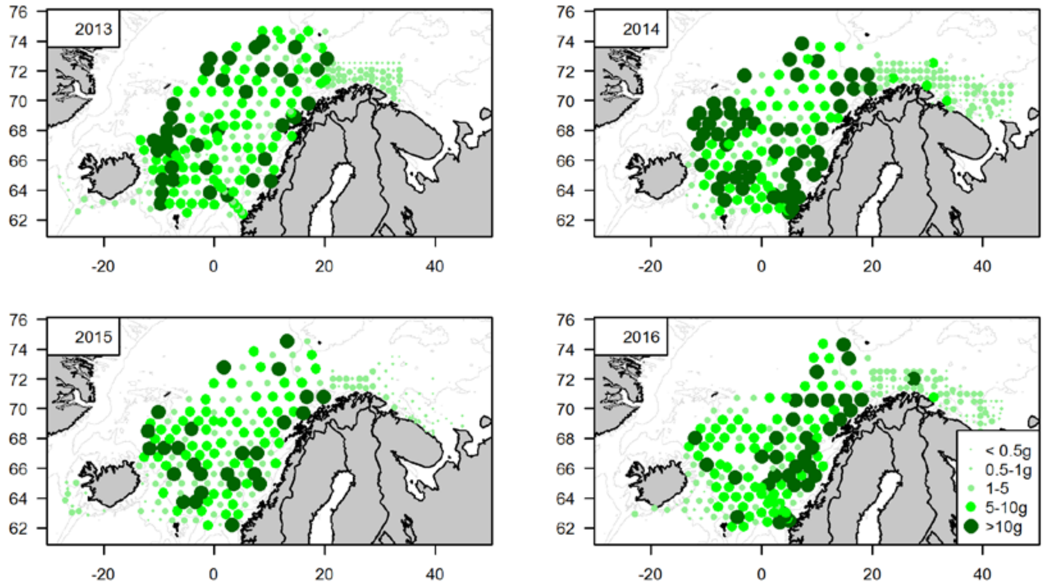

Figure 11. Zooplankton biomass (g dw m-2; 200–0 m in April-June 2013-2016.

(a)

(b)

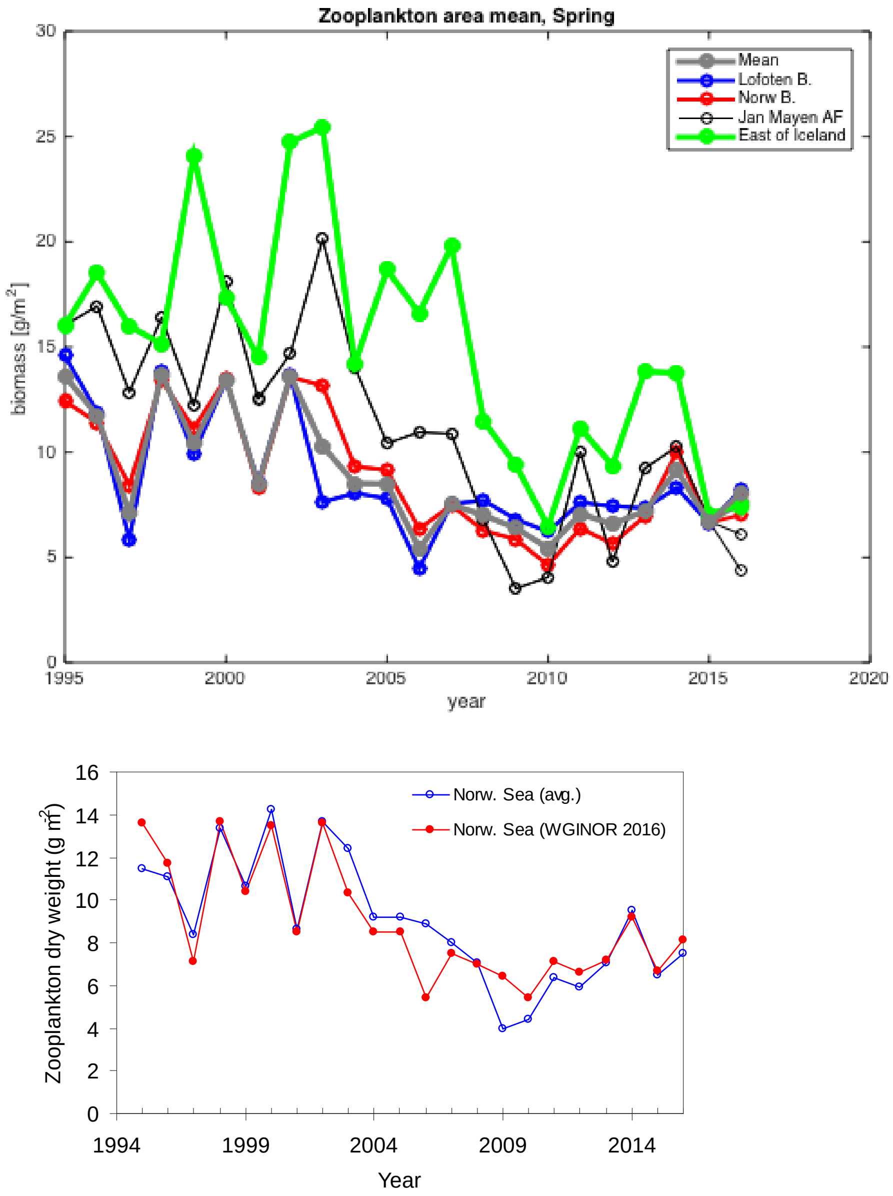

Figure 12. Indices of zooplankton dry weight (g m^{-2}) sampled by WP2 in May in (a) the different areas in and near Norwegian Sea from 1997 to 2016 as derived from interpolation using objective analysis utilizing a Gaussian correlation function (see details on methods and areas in ICES 2016a) and (b) comparison of the Gaussian derived times-series for the Norwegian Sea (red filled circles) and average dry weight across all stations in the Norwegian Sea (blue open circles; the previous index).

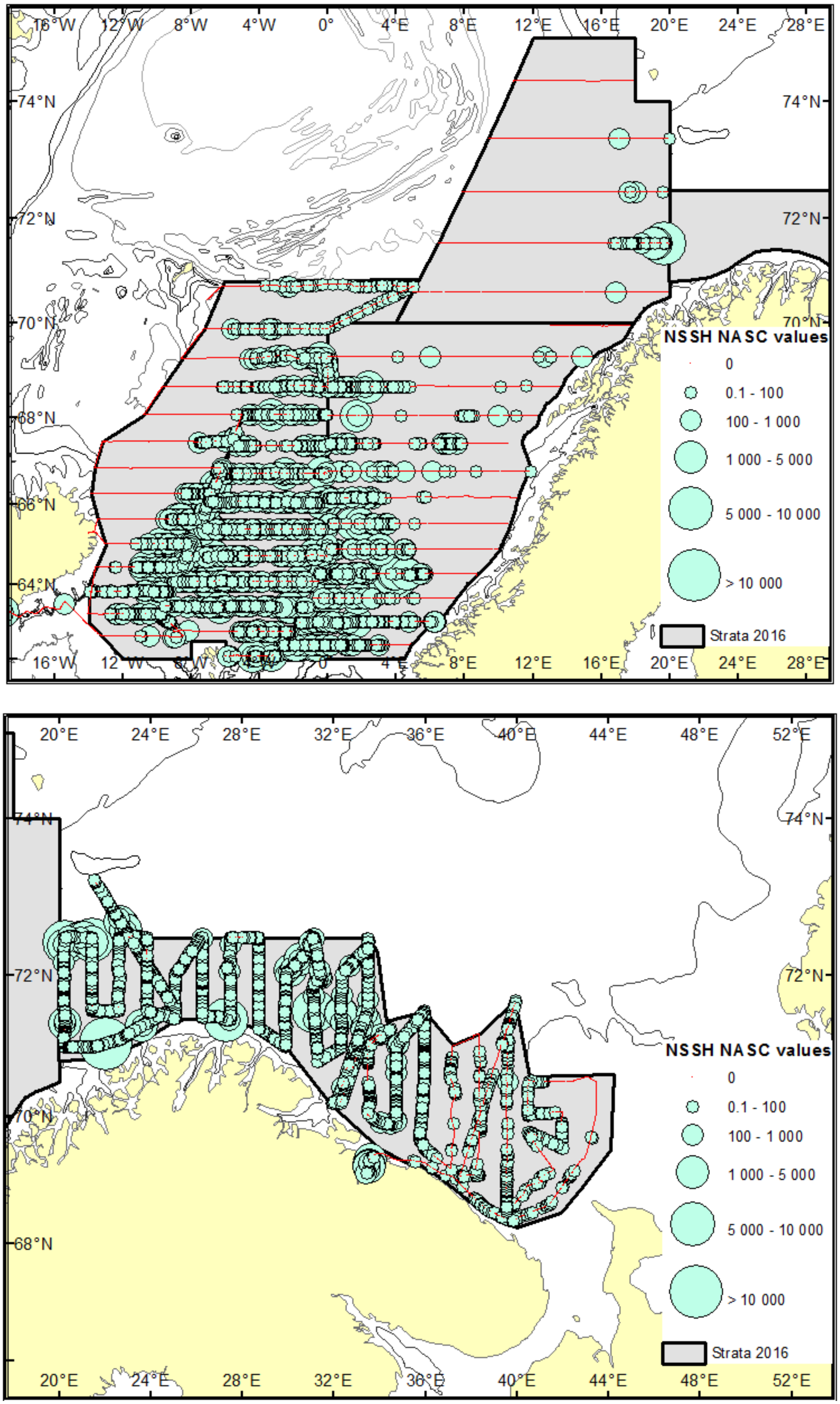

Figure 13. Distribution of Norwegian spring-spawning herring as measured during the IESNS survey in April-June 2016 in terms of NASC values (m^2/nm^2) for every 1 nautical mile in Norwegian Sea (upper panel) and in the Barents Sea (lower panel). The stratification of the survey area is shown on the maps.

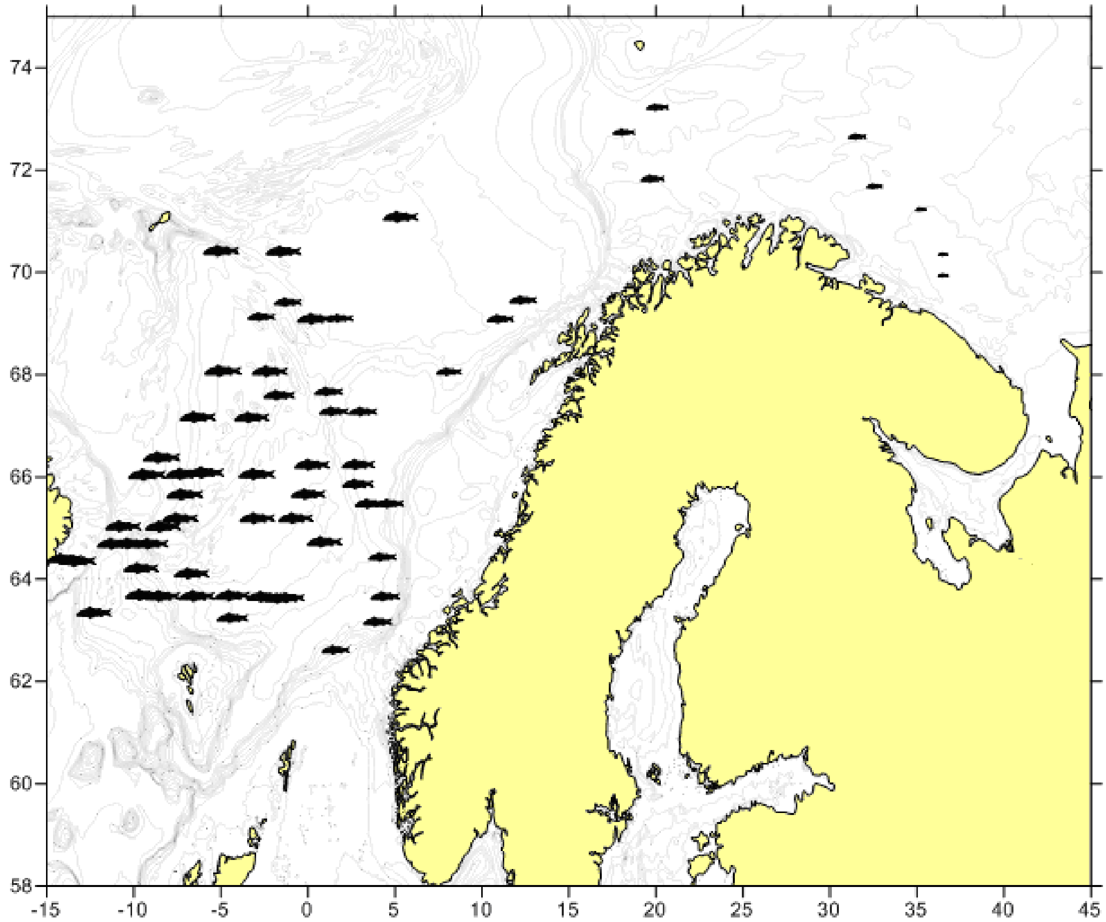

Figure 14. Mean length of Norwegian spring-spawning herring in all hauls in April-June 2016. Size of fish symbols represent relative mean lengths of the species caught in the hauls that contained 10 or more specimens (minimum mean length 13.7; maximum mean length 37.5).

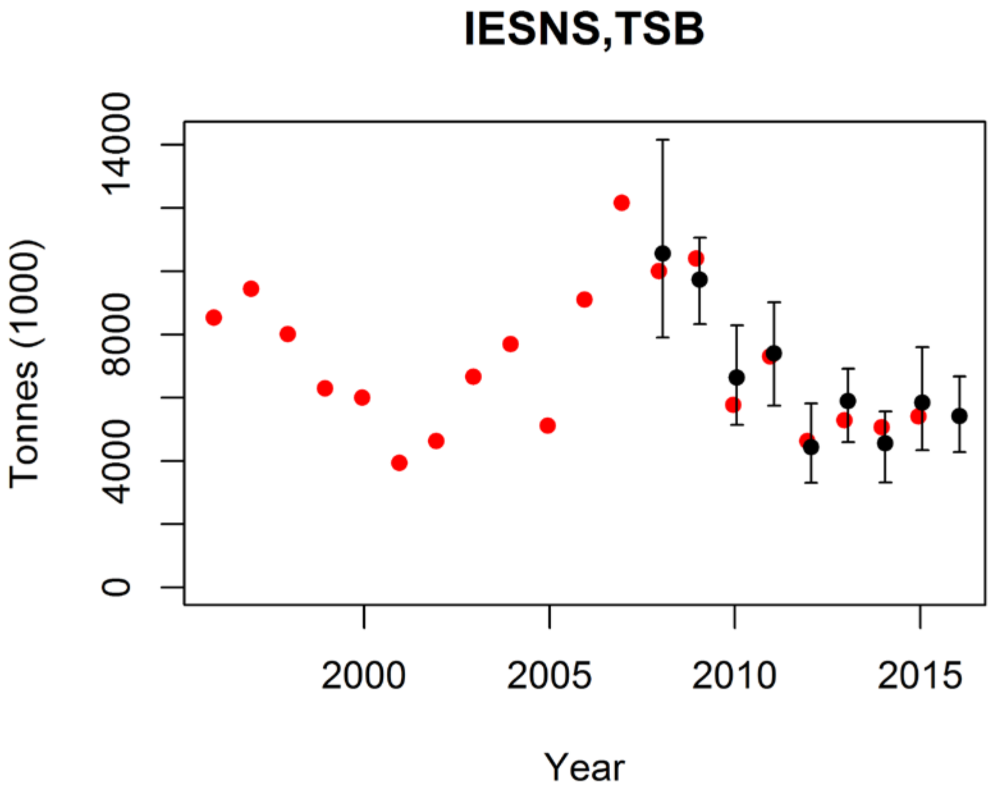

Figure 15. The annual biomass index of Norwegian-spring spawning herring in the IESNS survey (Barents Sea, east of 20°E, is excluded) from 1996 to 2016 as estimated using BEAM (red dots; calculated on basis of rectangles) and as estimated with the software StoX (black dots with 95% confidence interval; calculated on basis of standard stratified transect design).

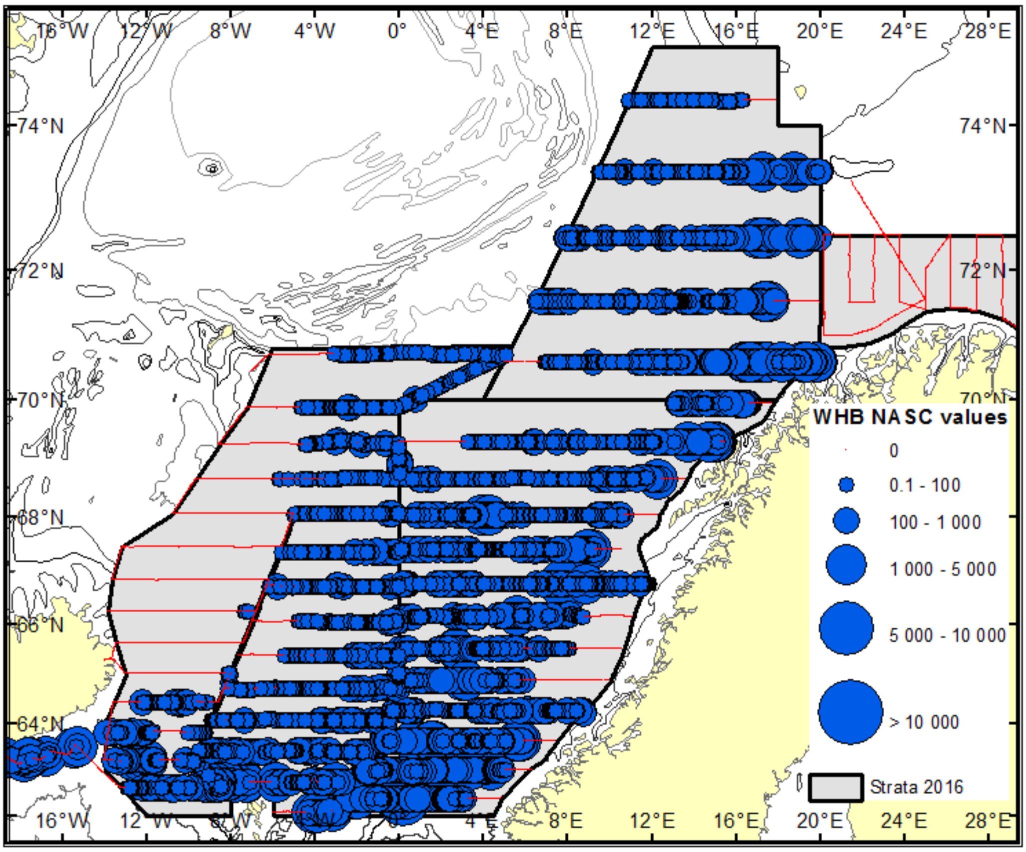

Figure 16. Distribution of blue whiting as measured during the IESNS survey in April-June 2016 in terms of NASC values (m^2/nm^2) for every 1 nautical mile. The stratification of the survey area is shown on the map.

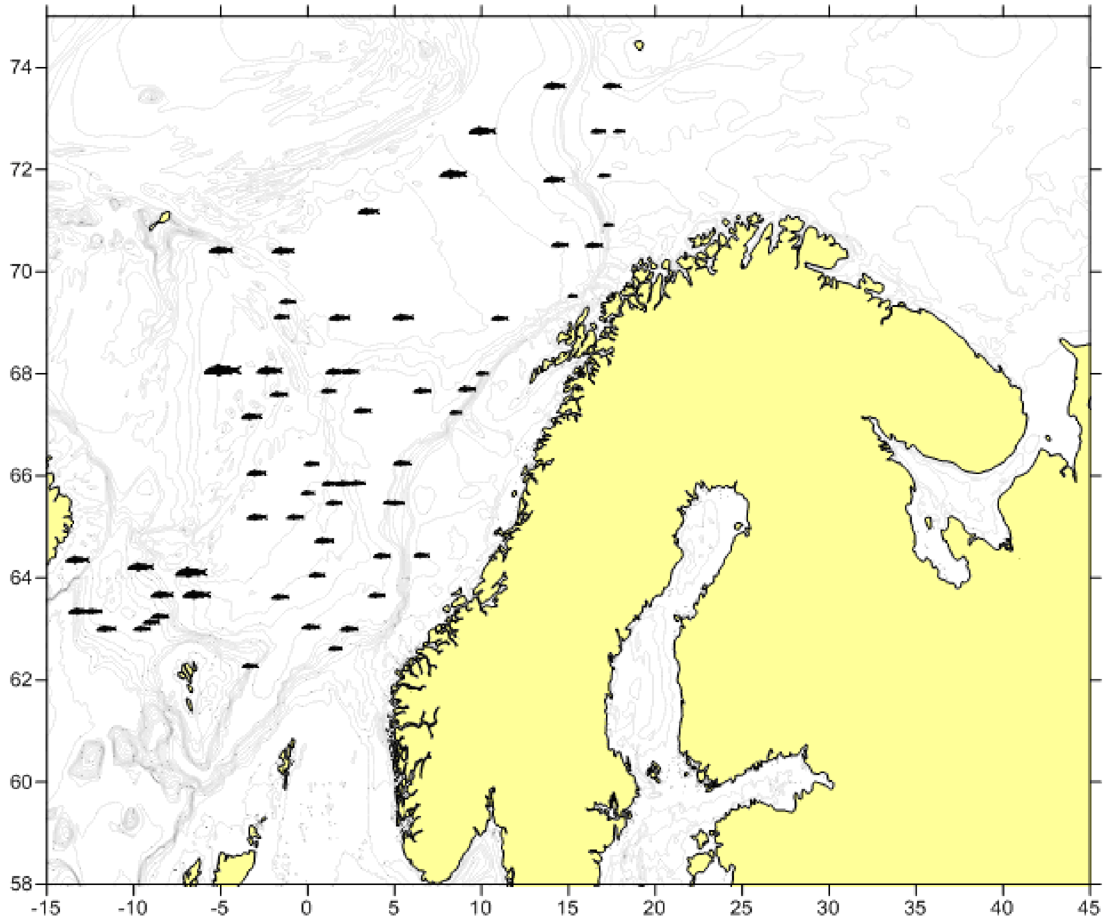

Figure 17. Mean length of blue whiting in all hauls in IESNS 2016. Size of fish symbols represent relative mean lengths of the species caught in the hauls that contained 10 or more specimens (minimum mean length 19.2; maximum mean length 32.9).

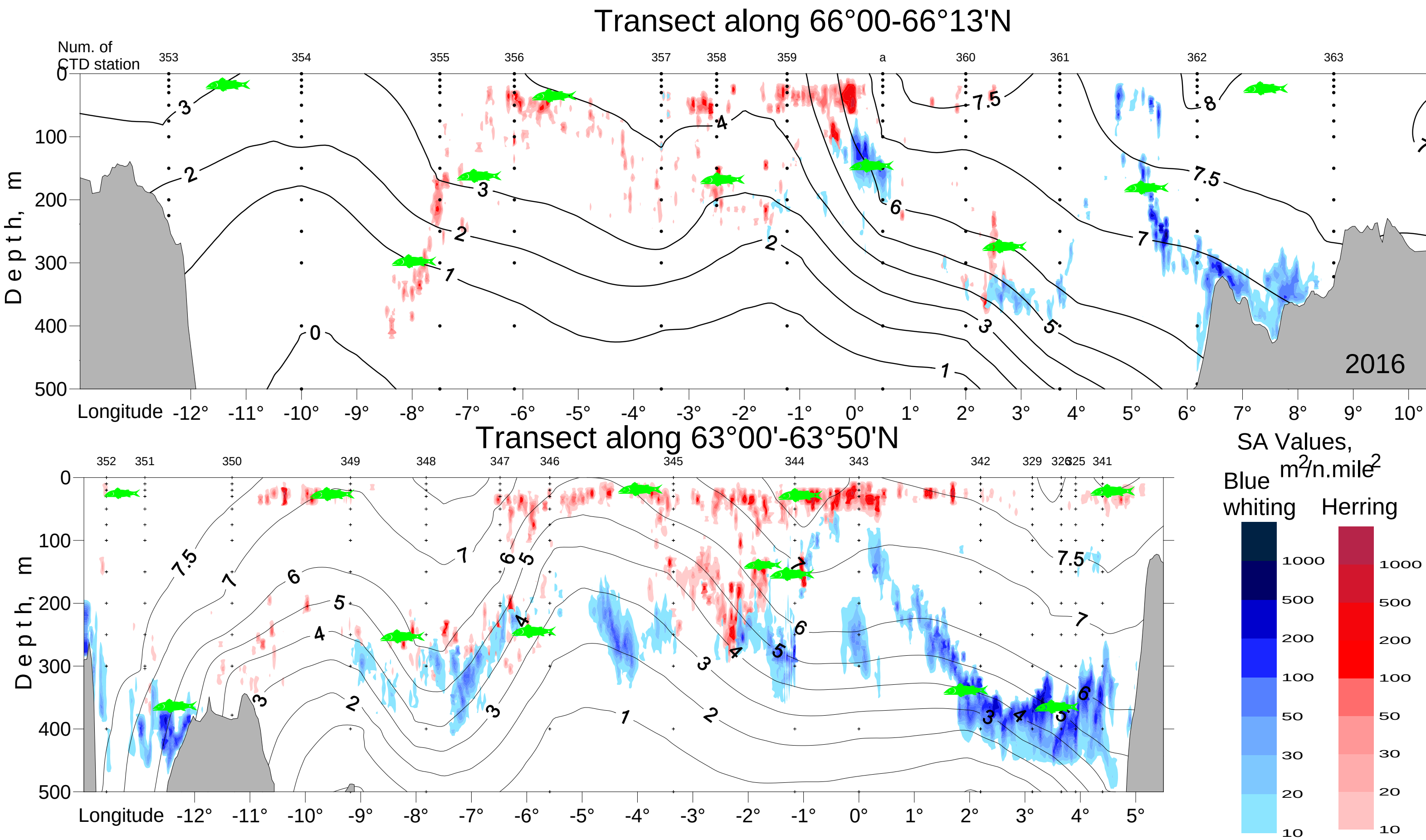

Figure 18. Acoustic values of NSS-herring (red) and blue whiting (blue), location of trawl stations (green fish) and temperature profile (black lines) along two transects across the whole Norwegian Sea in May 2016 covered by "Johan Hjort".

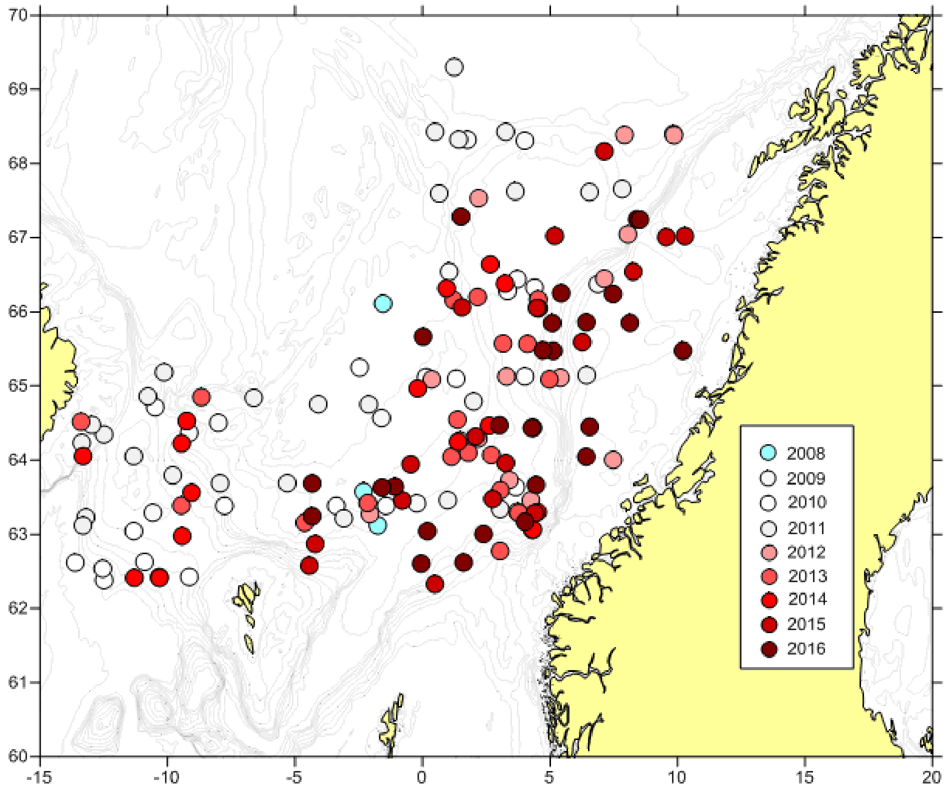

Figure 19. Distribution of hauls containing mackerel in IESNS surveys during 2008-2016.

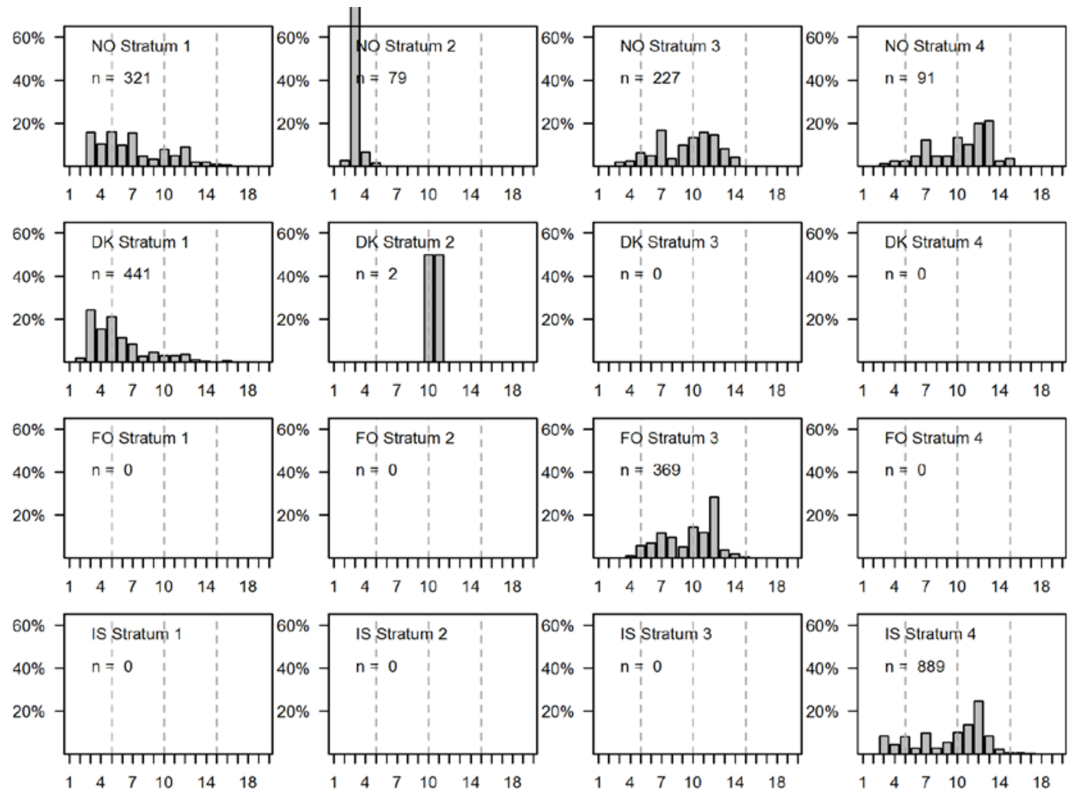

Figure 20 Comparison of the age distributions of NSS-herring by stratum and country in IESNS 2016. The strata are shown in Fig. 3.

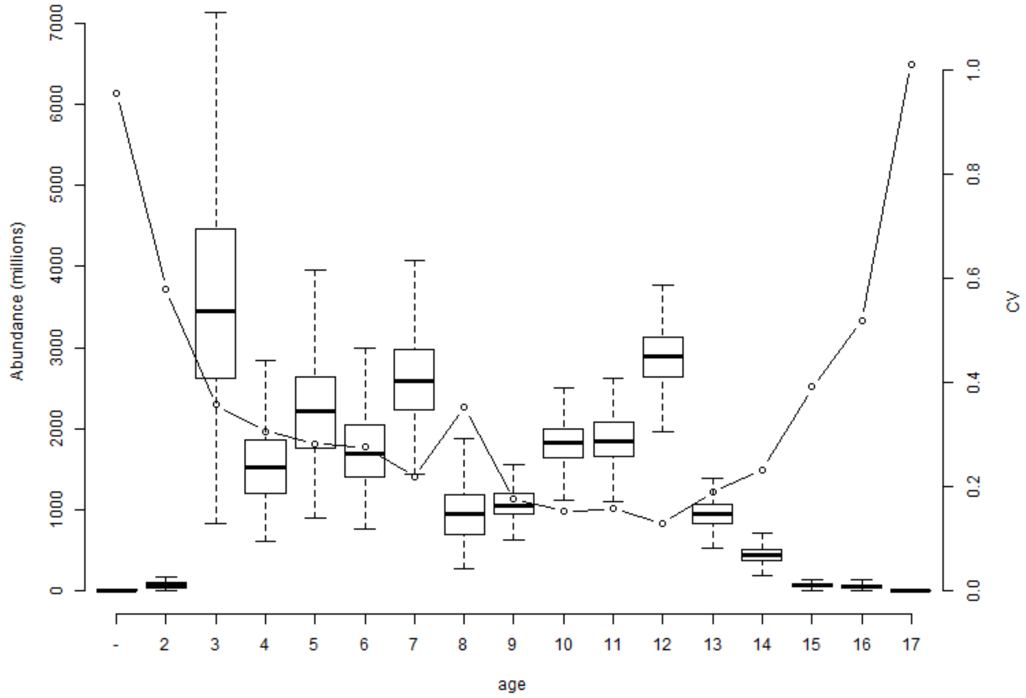

Figure 21. Norwegian spring-spawning herring in the Norwegian Sea: R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 500 replicates using the StoX software.

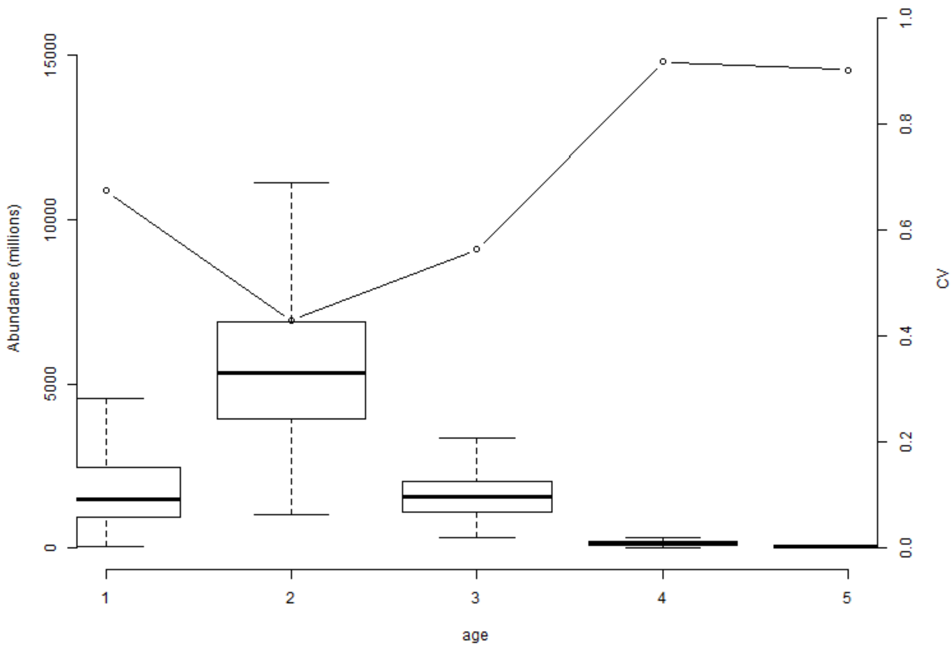

Figure 22. Norwegian spring-spawning herring in the Barents Sea: R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 500 replicates using the StoX software.

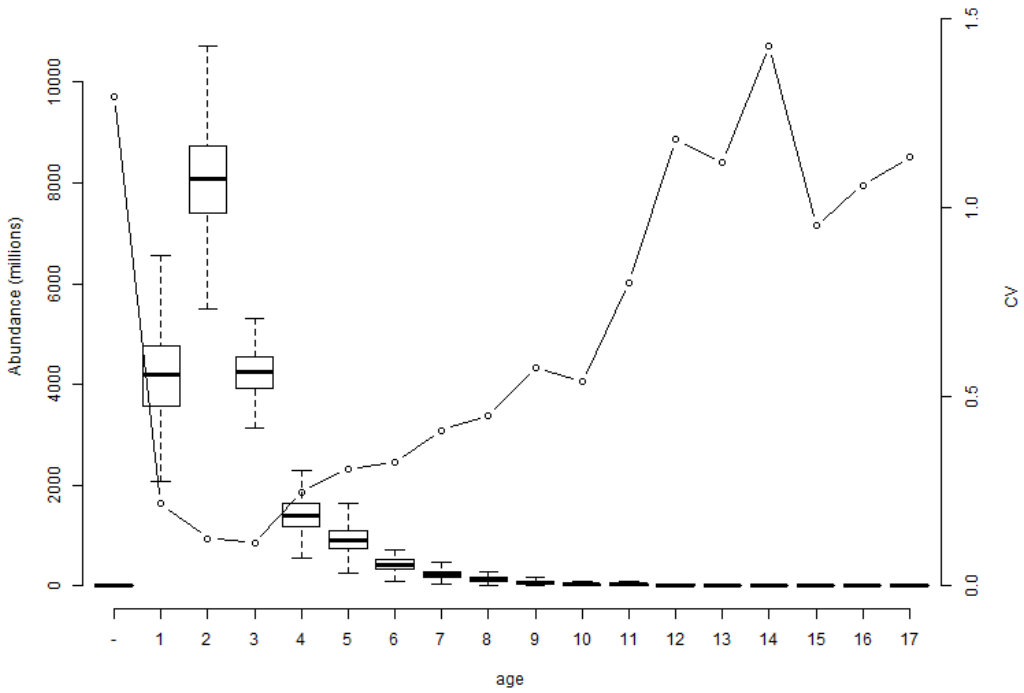

Figure 23. Blue whiting in the Norwegian Sea: R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 500 replicates using the StoX software.

Annex 4c: The Coordinated Acoustic Survey in the Skagerrak and Kattegat, the North Sea, West of Scotland and the Malin Shelf area (HERAS)

Survey Summary table	
Name of the survey (abbreviation):	HERAS
Summary:	
The 2016 survey covered all planned strata and survey effort, timing and coverage were comparable to previous years. Inclement weather and mechanical difficulties caused a reduction of effort in strata 131 and transect spacing was increased. This stratum typically does not contribute significantly to the overall estimate and all main aggregations of sprat and herring are considered to have been sampled sufficiently. Comprehensive trawling was carried out over the course of the survey providing good confidence in school recognition and supporting biological data for age stratified abundance estimation of the target species in most strata. The absence of trawl information from strata 101 due to mechanical problems is not considered to have had a significant effect on North Sea herring and sprat stock indices as contribution from this stratum to the overall indices is minor. The information used from neighbouring strata is considered adequate. No trawl information was secured in strata 1a and 1b. Again, it should be noted that this stratum contributed a relatively small amount of biomass and is not considered to have biased the overall index values for Malin Shelf Herring. Distribution of herring in the North Sea area was similar to recent surveys, in the Malin Shelf area all herring was found in the northern part of the area (north of 56°N). Abundance of herring was largely comparable to recent surveys in the North Sea area, but significantly lower in the Malin Shelf area. Sprat was also encountered within the expected areas. Abundance in the North Sea was the highest of the time series. In Div. IIIa however, the estimate was reduced and below the long term average. The estimates derived from the 2016 survey are considered to be valid for all stocks and consistent with those in each time series.	

	Description
Survey design	Stratified systematic parallel design with randomised starting point within each strata.
Index Calculation method	StoX (via ICES database) is used to provide indices of abundance. StoX calculated abundances in strata covered by Norway (strata11 and 141) are split by proportion WBSS and NSAS following the Norwegian national method that has been used for the whole time series before being combined with StoX calculated abundances from all other strata.
Random/systematic error issues	No specific issues for this survey outside of those described for standardised acoustic surveys
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	Not an issue. During severe weather survey effort was paused until conditions improved.
Extinction (shadowing)	NA, Target species not thought to aggregate in dense enough schools to produce extinction effects.
Blind zone	NA, Target species typically not found in large quantities near the surface in this area (herring and sprat).
Dead zone	NA, Target species typically not distributed tight to seabed (herring and sprat).
Allocation of backscatter to species	Species composition verified by directed trawling. Allocation of backscatter to species mainly using multifrequency algorithms in LSSS and Echoview.
Target strength	Standard agreed
Calibration	Survey frequencies calibrated according to SISP and results within recommended tolerances.

The 2016 ICES Coordinated Acoustic Survey in the Skagerrak and Kattegat, the North Sea, West of Scotland and the Malin Shelf area

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Six surveys were carried out during late June and July covering most of the continental shelf in the North Sea, West of Scotland and the Malin Shelf. The surveys are presented here as a summary in the report of the ICES Working Group for International Pelagic Surveys (WGIPS) and component survey reports are available individually on request. The global estimates of herring and sprat from these surveys are reported here. The global survey results provide spatial distributions of herring and sprat and total abundance by number and biomass at age as well as mean weight and fraction mature at age.

The estimate of North Sea autumn spawning herring spawning stock biomass is slightly higher than previous year at 2.6 million tonnes largely due to an increase in the number of fish in the stock (2016: 17 499mill. fish, 2015: 14 222 mill. fish). The stock is now dominated by young fish of age 2 and 3 wr.

The 2016 estimate of Western Baltic spring-spawning herring SSB is 78 000 tonnes and 537 million. This is a reduction of more than 60% compared to the 2015 estimates of 207 000 tonnes and 537 million fish and a return to the very low stock levels observed between 2009 and 2014.

The West of Scotland estimate (VIaN) of SSB is 87,713 tonnes and 483,200 individuals, a considerable decrease compared to the 387 000 tonnes and 1 935 million herring estimate in 2015.

The 2016 SSB estimate for the Malin Shelf area (VIaN-S and VIIb,c) is 87,713 tonnes and 483,200 individuals and is the same figure as for the West of Scotland estimate (VIaN) as no herring were observed south of the 56°N line of latitude. This is a significant decrease compared to 2015 (430 000 tonnes and 2 181 million herring).

The total abundance of North Sea sprat (Subarea IV) in 2016 was estimated at 124 588 million individuals and the biomass at 1118 000 tonnes (Table 5.10). This is the highest estimate observed in the time series, in terms of both abundance and biomass. The stock is dominated by 1- and 2-year-old sprat. The estimate also included 0-gr sprat (20% in numbers, and 2% in biomass), which only occasionally is observed in the HERAS survey.

In Division IIIa, the sprat abundance is estimated at 957 million individuals and the biomass at 13 516 tonnes. This is well below the long-term average both in terms of abundance and biomass. The stock is dominated by 2-year-old sprat.

Introduction

Six surveys were carried out during late June and July covering most of the continental shelf north of 52°N in the North Sea and to the west of Scotland and Ireland to a northern limit of 62°N. The eastern edge of the survey area was bounded by the Norwegian, Danish, Swedish and German coastline and to the west by the shelf edge at around 200 m depth. Individual survey reports from participants are available on request from the nation responsible. The vessels, areas and dates of cruises are given in Table 5.1 and in Figure 5.1.

Table 5.1. Vessels, areas and cruise dates during the 2016 herring acoustic surveys.

VESSEL	PERIOD	CONTRIBUTING TO STOCKS	STRATA
Celtic Explorer (IRL) EIGB	18 June – 06 July	MSHAS, WoS	2, 3, 4, 5, 6
Scotia (SCO) MXHR6	25 June – 15 July	MSHAS,WoS, NSAS, Sprat NS	1a, 1b, 91 (north of 58°30'N), 101
Scottish Charter (SCO)	25 June – 15 July	NSAS	111, 121
Johan Hjort (NOR) LDGJ	27 June – 14 July	NSAS, WBSS	11, 141
Tridens (NED) PBVO	27 June – 122 July	NSAS, Sprat NS	81, 91 (south of 58°30'N)
Solea (GER) DBFH	29 June – 19 July	NSAS, Sprat NS	51, 61, 71, 131
Dana (DEN) OXBH	22 June – 5 July	NSAS, WBSS, Sprat NS, Sprat IIIa	21, 31, 41, 151

Methods

Survey design and acoustic data collection

The acoustic surveys were carried out and analysed in accordance with the ICES survey manual for International Pelagic Surveys (ICES 2015b) using Simrad EK60 and EK80 echosounders with transducers mounted either on the hull, drop keel or in towed bodies. Only data gathered at 38kHz was used for the analysis. Data collected at other frequencies was used for target discrimination. Echo integration and further data analyses were carried out using either LSSS (Large Scale Survey System), Myriax Echoview or Ev2Akubio software. The survey tracks were selected to cover the whole area with sampling intensities based on the herring densities of previous years. Transect spacing between 7.5 and 37.5 nautical miles were used in various parts of the area according to perceived abundance and variance from previous years' surveys (Table 5.18). The survey was designed to be analysed using StoX with an internal agreed strata system (Figure 5.1-5.2).

A total of 9858 n.mi of track covered during the survey was used in the acoustic analysis, achieving good coverage of the entire survey area. Trawling effort was adequate to achieve good resolution of length distribution and biological parameters in most strata. In two strata no trawl hauls were available due to mechanical failure (strata 101) or failure to capture herring due to very low numbers present (strata 1a and 1b).

The following target strength to fish length relationships were used to analyse the data:

herring	TS = 20 log L - 71.2 dB
sprat	TS = 20 log L - 71.2 dB
gadoids	TS = 20 log L - 67.5 dB
mackerel	TS = 21.7 log L - 84.9 dB

Data analysis

The 2016 disaggregated biological and acoustic data were delivered to the new acoustic survey database held at the ICES data centre and the data was analysed using StoX analysis software. Data for strata covered by Denmark (21, 31, 41 and 151) were analysed using the Danish national calculation method used up to 2014 (WKEVAL: ICES 2015) and combined with StoX calculated estimates for the relevant stocks.

Acoustic and biological data were combined to provide an overall global estimate. Estimates of numbers-at-age, maturity stage and mean weights-at-age were calculated by individual survey strata (Figure 5.1). In strata where no biological info was collected (strata 101 and 1) information from nearest hauls in adjoining strata were used. The data were combined to provide estimates of the North Sea autumn spawning herring, Western Baltic spring-spawning herring, West of Scotland (VIaN) herring and Malin Shelf herring stocks (VIaN-S and VIIb-c) as well as North Sea sprat and sprat in IIIa.

Stock definitions

North Sea Autumn Spawning herring (NSAS)

Includes all herring encountered in the North Sea between 4°W and 2°E and south of 56°N [56.5°N between 2-6°E] (strata 81, 91, 101, 111, 121 in Figure 5.1). East of 2°E and north of 56°N [56.5°N between 2-6°E], in strata 11, 141, 151, 41, 31 and 21, herring is split into North Sea autumn spawners and Western Baltic spring spawners (Figure 5.2). In strata 11 and 141 this is based on analysis of number of vertebrae and in strata 21, 31, 41 and 151 is based on otolith shape analysis.

Western Baltic spring spawning herring (WBSS)

The allocation to the Western Baltic spring spawning stock is partly a geographical assignment and partly a biological assignment based on the vertebrae and otolith shape analysis mentioned above. The stock splitting methodologies are only applied within strata 11, 21, 31, 41, 141 and 151 (Figure 5.3). Recently Germany has also conducted analysis of otoliths to deduct stock membership of herring in the southern area, and in 2015 two herring from 41F5 were allocated as WBSS. As this rectangle previously has not been included in the stock split, this was ignored in the 2015 analysis to preserve continuity with the time series, but opens a discussion on the geographical limits of the application of the stock splitting analysis.

Malin Shelf Herring (MSHAS)

Includes all herring in the stock complex located in ICES areas VIa and VIIb. The survey area is bounded in the west and north by the 200m depth contour, in the south by the 53.5°N latitude, and in the east by the 4°W longitude (strata 1 - 6 in Figure 5.1). The survey targets herring of VIaN and VIaS spawning origin in mixed feeding aggregations on the Malin Shelf. Work is in progress to split the abundance and biomass estimates by spawning origin (VIaN vs VIaS), but this has been as yet unsuccessful. The differentiation between VIa herring and North Sea herring across the 4°W line of longitude is purely based on geography.

West of Scotland herring (VIaN)

This is a subset of the Malin Shelf herring abundance\biomass estimate based purely on geographical location (strata 1 - 4 in Figure 5.1). All herring recorded north of the 56°N line of latitude are reported as West of Scotland (VIaN). This distinction is kept to maintain a comparable time series of herring abundance to the West of Scotland. The area North of the 56°N line of latitude has been covered annually since 1991 whereas the extended area (MSHAS index) has only been covered since 2008.

North Sea sprat (Sprat NS)

All sprats recorded in the North Sea geographical area (ICES area IV) are included in the North Sea sprat stock. Sprat is however very rarely recorded in the northern part (strata 11, 91, 111, 121 and 141 in Figure 5.2).

Div. IIIa Sprat (Sprat IIIa)

Sprat in IIIa is also a geographically delimited stock. All sprats in strata 21, 31 and 41 are included in this index. The border between ICES Div. IIIa and Div. IV was revised in 2015. The new border has been used for index calculation since 2015, but prior to this the old border was used to delineate the stocks.

Acoustic Survey Results for 2016

The survey strata used for the analysis are shown in Figure 5.1. The area covered during the national acoustic surveys is given in Figure 5.2. and magnitudes of acoustic herring and sprat detections (nautical area scattering coefficients) for 15 nmi intervals are given in Figures 5.3 and 5.4, respectively. The survey provides numbers at age for the different herring and sprat stocks (North Sea autumn-spawners, Western Baltic spring-spawners, West of Scotland, Malin Shelf herring, North Sea sprat and Div. IIIa sprat) and the time series of these are given in Figures 5.5-5.10. The time series of abundance for the four herring stocks (North Sea autumn-spawners, Western Baltic spring-spawners, West of Scotland and Malin Shelf herring) are given in Tables 5.6 – 5.9 and illustrated in Figures 5.11 - 5.14, respectively. In each of them, a 3 year running mean is included to show the general trend more clearly.

Herring

The NASC values attributed to herring throughout the HERAS survey are shown in Figure 5.3a and b.

The estimate of North Sea autumn spawning herring spawning stock biomass has increased from 2.3 million tonnes in 2015 to 2.6 million tonnes this year (Table 5.6, Figure 5.11).

The abundance of mature fish has increased from 14 222 million in 2015 to 17 499 this year (Table 5.2) and is largely responsible for the increase in SSB. The mean weight of mature fish continues to decrease and is now 151.3 g compared to 160.3 g last year. This is largely due to the large amount of 2 and 3 winter ring fish entering the SSB combined with a decrease in weight of the 2 winter ring fish from 121 g to 112 g this year. The increase in weight for all other ages this year has offset the effect of this to some extent. The large increase in 2 and 3 winter ring fish continues to shift the abundance to a larger amount of smaller fish.

The abundance of immature fish in the stock has increased to 34 187 million this year from 10 285 in 2015. This is mainly due to high numbers of 0 winter ring fish which were almost entirely absent in the 2015 survey. The 1 winter ring abundance is also high and above the long term average. (Table 5.6, Figure 5.5).

Maturities were comparable to last year, with 71% of 2 winter ringers and 89% of 3 winter ringers mature. 100% maturity was only reported above age 7 (Table 5.2). The presence of immature fish above age 4 indicates a shift in reporting by the group in 2015. Previously all fish above age 4 have been assumed to be mature. In 2015 however it was agreed that observed maturities would be reported and it would be left to the assessment working group to decide whether to assume 100% maturity above a certain age.

The 2008 and 2009 year classes (6 and 7-winter ringers this year) continues to be strong and are consistent with the high estimate of 1-wr fish in 2010 and 2011 (Table 5.6, Figure 5.5). The 2012 and 2013 year classes (2 and 3 winter rings this year) are emerging as strong year classes also. The 2007 year class (8-winter rings this year) continues to grow very slow and mean weight continues to be below that of the following year class (Table 5.2).

The distribution of adult herring in the North Sea is still concentrated in the areas east and north of Scotland (Figure 5.3). Similarly to last year the distribution is stretching south in the western North Sea.

The 2016 estimate of Western Baltic spring-spawning herring SSB is 78 000 tonnes and 537 million herring (Table 5.3). This is a decrease of 62% in both biomass numbers compared to 2015 and a return to the very low stock levels observed between 2009 and 2014. The decrease was primarily driven by an 80% decrease in numbers of both 1 and 2 winter ring fish from the year before. The stock is dominated by 2 and 3 winter ring fish (Table 5.7, Figure 5.6). The numbers of older herring (3+ group) in the stock has returned to the 2009 to 2014 level, but comprise a relatively large proportion of the total stock compared to this period (40% as compared to an average of 30% for 2009 to 2015). Mean weights at age and maturities were comparable to last year’s.

The West of Scotland (VIaN) estimate of SSB is 87,713 tonnes and 483,200 individuals (Table 5.4), a considerable decrease compared to the 387 000 tonnes and 1 935 million herring estimate in 2015. Long-term indices of abundance per age class for West of Scotland herring are provided in Table 5.8 and Figure 5.7.

As no herring was observed south of the 56°N line of latitude, the 2016 SSB estimate for the Malin Shelf area (VIaN-S and VIIb,c) is the same figure as for the West of Scotland estimate (VIaN). The 2016 estimate is significantly lower when compared to 2015 (430,000 tonnes and 2,181 million herring). This is the first point in the Malin Shelf area time series (2008-present) where no herring were observed south of 56°N. In 2015, the biomass of herring in VIaS and VIIb,c was 55,315 tonnes. The 2016 pattern of distribution and large reduction in survey biomass are not easily explained considering both survey effort and timing were comparable across years. The 2015 estimate was almost 150,000 tonnes higher than in 2014 and this was attributed in the main to a high abundance of herring observed along the 4°W bordering line of longitude. Herring are often found in high densities to the east of the 4°W line in association with a specific bathymetric feature. However, the occurrence of these herring west of the line has the ability to strongly influence the annual estimate of abundance of the Malin Shelf survey. The lack of herring to the south of 56°N is most likely due to the more northern distribution in 2016 and likely to be related to better feeding opportunities further north (O’Donnell *et al.*, 2016).

In 2015 the estimate was dominated by 4, 6, and 5 winter ringed fish and ranked accordingly. In 2016, 6, 5 and 4 winter ringed fish dominated representing 61.7% of total biomass and 57.5% of total abundance. Immature fish represented a small proportion of TSB in 2016 (0.2%; 194 tonnes) and TSN 0.3% (1,630 individuals). Age disaggregated survey abundance indices for Malin Shelf herring since 2008 are given in Table 5.9 and Figure 5.8. Estimated survey uncertainty for Malin Shelf herring is shown in Figure 5.15 and Table 5.16.

Sprat in the North Sea and Division IIIa

In the North Sea, sprat data were available from strata 51, 61, 71, 81, 91, 101, 131 and 151. No sprats were observed in the northern part of the North Sea in strata 11, 111, 121 and 141. In strata 101 and 91 sprats were mostly found in coastal areas, as in 2015. In 2014, no sprats were found in this part of the survey, and the coastal distribution of sprats probably explains some of the high variability in abundances between years. In the strata 51, 61, 71, 81 and 131 survey area, sprat as in previous years were distributed throughout the whole survey area. Highest sprat densities were measured in the southern part of the survey area (strata 51 and 61). In the 2016 and 2015 acoustic surveys, sprats were found further north than in 2014, but concentrated in the southern part of the North Sea, with the highest abundances and biomass in an area below 55° N. The southern limit of the surveyed area is at 52° N. There is no indication that the southern limit of the sprat stock distribution has been reached; it is likely that sprats can be found even further south in the English Channel. The sprat distribution in the North Sea and Division IIIa in terms of abundance and biomass per strata is shown in Table 5.17. The NASC values attributed to sprat in the survey are shown in Figures 5.4a and 5.4b.

The total abundance of North Sea sprat (Subarea IV) in 2016 was estimated at 124 588 million individuals and the biomass at 1118 000 tonnes (Table 5.10). This is the highest estimate observed in the time series both in terms of abundance and biomass. Compared to the previous historic high of the time series (the 2014 estimate), abundance and biomass have increased by 41 and 54%, respectively (Table 5.11, Figure 5.9). The stock was dominated by 1- and 2-year-old sprat (85% of biomass), and more than half of the sprat were found to be mature (57%) (Table 5.10). The 2016, 2015 and 2014 sprat biomass estimates are all well above the long-term average for the survey time series (Table 5.11).

An age-disaggregated time-series of North Sea sprat abundance and biomass (ICES Subarea IV), as obtained from the acoustic survey, is given in Table 5.11. Note that for 2003, information on the sprat distribution in the North Sea is available from one nation only.

In Division IIIa, sprats were mostly found in the Kattegat (strata 21) and, in very small amounts, in the Skagerrak area (43F9), as in 2014-2015. This is in contrast to 2013, when sprats were only seen in the Kattegat. The abundance is estimated at 957 million individuals, a decrease by 52% compared to the 1386 million individuals in 2015 (Tables 5.12-5.13). The biomass has decreased by 31% to 13 500 tonnes. 2-year-old sprat dominate the stock (70% in numbers and 64% in biomass), while also the 3+ group was a large proportion of the stock. The age-disaggregated time-series of sprat abundance and biomass in Division IIIa are given in Table 5.13 and Figure 5.10. The sprat distribution in the North Sea and Division IIIa in terms of abundance and biomass per strata is shown in Table 5.17. The NASC values attributed to sprat in the survey are shown in Figures 5.4a and 5.4b.

Quality considerations

Changing analysis tool and database

The 2016 HERAS global survey estimates of abundance were calculated using StoX, with input files (XML) generated via the ICES Acoustic database. It was shown for the 2015 survey that the effect of changing the calculation method to StoX had very little effect on the resulting indices carried forward to the stock assessment process (ICES 2016; Annex 9) The group is therefore confident that the latest index at age is comparable to the existing time series.

The delivery of disaggregated acoustic and biological data to the group continues to be considered an improvement to the survey analysis. It allows a level of transparency and discussion on data collection and standardisation issues not readily achieved before.

Strata without strata specific trawl information

Herring abundance from the northern Scottish component of the Malin Shelf survey (Strata 1, Figure 5.1) was calculated using biological data collected from hauls carried out in neighbouring stratum. This was necessary as no strata specific trawl information was available. However, it should be noted that this relates to a relatively small amount of biomass. The allocation of haul data from neighbouring strata is stored and available in the Malin Shelf StoX project file.

The same consideration applies to the lack of strata specific trawl information in strata 101 (Figure 5.1). Haul allocation is available in the North Sea Sprat StoX project file

Scrutiny of Danish acoustic data

In the Danish survey scrutiny is only taken to the level of distinguishing between fish or not fish, and the echo traces are then partitioned based entirely on composition of trawl catches. This approach is not compatible with best practice anymore and it should be possible to use modern acoustics species discrimination techniques to apply a more specific allocation. At WGIPS 2017 a scrutiny exercise with all participants was carried out for Danish data, and there was general agreement that it is possible to standardise Danish scrutiny methods to align with those used by other participants. The 2017 Danish survey will be scrutinised following methods used by the rest of the group with support from other HERAS participants.

Stock splitting methods

At present two different methods are used within the survey to assign herring in the splitting area (strata 11, 21, 31, 41, 141 and 151) to the North Sea autumn spawning stock or the Western Baltic spring spawning stock. These methods have been developed independently within national laboratories, but have not been calibrated against each other so far. To ensure resilience in the consistency over the time series, the two methods should be calibrated against each other. But ideally, the method should be standardised across the surveys to use one common method for all splitting between the two stocks.

Recently Germany has also conducted analysis of otoliths to deduct stock membership of herring in the southern area, and in 2015 two herring from 41F5 were allocated as WBSS. As this rectangle has not been previously included in the stock split this was ignored in the 2015 analysis to preserve continuity with the time series, but opens a discussion on the geographical limits of the application of the stock splitting analysis.

In addition, the method used by Norway does not provide stock information at the individual fish level and it is therefore not possible at the present, to analyse the Norwegian component of the survey within an overall StoX project for the two herring stocks. This means that at the present time it is still not possible to routinely produce uncertainty estimates for the herring stocks.

An ICES workshop to address this issue and to provide guidance on data collection and analysis of this survey has been planned for November 2017 (WKSIDAC).

VIaN and VIaS: Work has been ongoing for a number of years to split the Malin Shelf herring survey into VIaN and VIaS spawning components using morphological (body and otolith) differences. To date, the successful classification rate has been unsatisfactory so both stocks of herring are reported as one from this survey. Genetic techniques are now being investigated to facilitate this split.

Maturity

Since the 2015 survey no assumptions have been made about expected full maturity above a certain age and those actually observed in the surveys are reported in this report. In the past (prior to 2015), fish 5 wr or older were all assumed mature by definition in the reported result. This is a decision that should be made in the assessment working group for each assessment, as the underlying data should be collected and reported as actually observed.

Survey uncertainty

The use of the StoX software for survey abundance estimation, concurrent availability of disaggregated survey data, and application of a transect-based approach allows for an estimate of survey uncertainty. However, in 2016 uncertainty estimates could only be calculated for Malin Shelf herring (Figure 5.15 and Table 5.16). For all other stocks the overall calculations of abundance could not be achieved within one StoX project due to issues with the database format for Danish data as well as issues with the stock splitting methodology mentioned above. The group continues to work with the ICES data centre to resolve the data base issues which are documented in Annex 8 in this report. The stock splitting methodology issue is expected to be progressed at the planned workshop in November 2017 (WKSIDAC).

Recommendations:

1) Danish acoustic data scrutiny review has been carried out and should be brought in line with the rest of the group from 2017 with help from other participants.

2) Reporting format. In this interim period the reporting outputs are restricted compared to that previously delivered. Visualisations of adult versus juvenile distributions and distribution by age groups and maturity levels cannot be easily produced at the present, but standard methods for producing such maps should be developed by the group for use with the new analysis outputs.

References

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Tables and Figures

Table 5.2. Total numbers (millions) and biomass (thousands of tonnes) of North Sea autumn spawning herring in the area surveyed in the acoustic surveys June - July 2016. Mean weights, mean length and fraction mature by age winter ring.

Age (ring)	Numbers	Biomass	Maturity	Weight(g)	Length (cm)
0	21044	98	0.00	4.6	8.4
1	9034	330	0.01	36.5	16.7
2	12011	1342	0.71	111.7	23.2
3	5832	924	0.89	158.3	26.0
4	1273	238	0.95	186.9	27.3
5	822	184	0.97	223.3	28.7
6	909	213	0.98	234.7	29.2
7	395	96	1.00	243.0	29.7
8	220	51	1.00	232.1	29.7
9+	146	35	0.99	236.4	30.0
Immature	34187	862		25.2	12.3
Mature	17499	2648		151.3	25.4
Total	51686	3509	0.34	67.9	16.7

Table 5.3. Total numbers (millions) and biomass (thousands of tonnes) of Western Baltic spring spawning herring in the area surveyed in the acoustic surveys June-July 2016. Mean weights, mean length and fraction mature by winter ring.

Age (ring)	Numbers	Biomass	Maturity	Weight (g)	Length (cm)
0	203	1	0.00	4	8.3
1	425	16	0.01	37	16.6
2	255	20	0.31	79	20.8
3	381	51	0.65	134	24.6
4	99	15	0.91	151	25.8
5	40	7	0.93	173	26.9
6	40	8	0.92	194	28.1
7	12	3	1.00	214	28.9
8+	28	6	0.98	215	29.2
Immature	947	47		50	16.7
Mature	537	78		146	25.3
Total	1484	125	0.36	85	19.8

Table 5.4. Total numbers (millions) and biomass (thousands of tonnes) of autumn spawning West of Scotland herring in the area surveyed in the acoustic surveys July 2016. Mean weights, mean lengths and fraction mature by winter ring.

Age (ring)	Numbers	Biomass	Maturity	Weight (g)	Length (cm)
0	0	0		0.0	0.0
1	0	0		0.0	0.0
2	30	4	0.97	136.9	24.4
3	108	15	0.99	140.3	25.0
4	88	15	1.00	174.6	26.8
5	112	23	1.00	201.9	28.3
6	79	16	1.00	208.0	28.7
7	62	13	1.00	209.0	29.0
8	6	1	1	210.0	29.3
9+	1	0	1	242.3	30.3
Immature	2	0		119.0	23.4
Mature	483	88		181.5	27.2
Total	485	88	1.00	181.3	27.2

Table 5.5. Total numbers (millions) and biomass (thousands of tonnes) of Malin Shelf herring (VIaN-S, VIIb,c) June-July 2016. Mean weights, mean lengths and fraction mature by winter ring.

Age (ring)	Numbers	Biomass	Maturity	Weight (g)	Length (cm)
0	0	0		0.0	0.0
1	0	0		0.0	0.0
2	30	4	0.97	136.9	24.4
3	108	15	0.99	140.3	25.0
4	88	15	1.00	174.6	26.8
5	112	23	1.00	201.9	28.3
6	79	16	1.00	208.0	28.7
7	62	13	1.00	209.0	29.0
8	6	1	1	210.0	29.3
9+	1	0	1	242.3	30.3
Immature	2	0		119.0	23.4
Mature	483	88		181.5	27.2
Total	485	88	1.00	181.3	27.2

Table 5.6. Estimates of North Sea autumn spawners (millions) at age and SSB from acoustic surveys, 1986–2016. For 1986 the estimates are the sum of those from the Division IVa summer survey, the Division IVb autumn survey, and the Divisions IVc, VIId winter survey. The 1987 to 2014 estimates are from summer surveys in Divisions IVa,b,c and IIIa excluding estimates of Western Baltic spring spawners. For 1999 and 2000, the Kattegat was excluded from the results because it was not surveyed. Total numbers include 0-ringers from 2008 onwards.

Years / Age (rings)	1	2	3	4	5	6	7	8	9+	Total	SSB ('000t)
1986	1,639	3,206	1,637	833	135	36	24	6	8	7,542	942
1987	13,736	4,303	955	657	368	77	38	11	20	20,165	817
1988	6,431	4,202	1,732	528	349	174	43	23	14	13,496	897
1989	6,333	3,726	3,751	1,612	488	281	120	44	22	16,377	1,637
1990	6,249	2,971	3,530	3,370	1,349	395	211	134	43	18,262	2,174
1991	3,182	2,834	1,501	2,102	1,984	748	262	112	56	12,781	1,874
1992	6,351	4,179	1,633	1,397	1,510	1,311	474	155	163	17,173	1,545
1993	10,399	3,710	1,855	909	795	788	546	178	116	19,326	1,216
1994	3,646	3,280	957	429	363	321	238	220	132	13,003	1,035
1995	4,202	3,799	2,056	656	272	175	135	110	84	11,220	1,082
1996	6,198	4,557	2,824	1,087	311	99	83	133	206	18,786	1,446
1997	9,416	6,363	3,287	1,696	692	259	79	78	158	22,028	1,780
1998	4,449	5,747	2,520	1,625	982	445	170	45	121	16,104	1,792
1999	5,087	3,078	4,725	1,116	506	314	139	54	87	15,107	1,534
2000	24,735	2,922	2,156	3,139	1,006	483	266	120	97	34,928	1,833
2001	6,837	12,290	3,083	1,462	1,676	450	170	98	59	26,124	2,622
2002	23,055	4,875	8,220	1,390	795	1,031	244	121	150	39,881	2,948
2003	9,829	18,949	3,081	4,189	675	495	568	146	178	38,110	2,999
2004	5,183	3,415	9,191	2,167	2,590	317	328	342	186	23,722	2,584
2005	3,113	1,890	3,436	5,609	1,211	1,172	140	127	107	16,805	1,868
2006	6,823	3,772	1,997	2,098	4,175	618	562	84	70	20,199	2,130
2007	6,261	2,750	1,848	898	806	1,323	243	152	65	14,346	1,203
2008	3,714	2,853	1,709	1,485	809	712	1,749	185	270	20,355	1,784
2009	4,655	5,632	2,553	1,023	1,077	674	638	1,142	578	31,526	2,591
2010	14,577	4,237	4,216	2,453	1,246	1,332	688	1,110	1,619	43,705	3,027
2011	10,119	4,166	2,534	2,173	1,016	651	688	440	1,207	25,524	2,431
2012	7,437	4,718	4,067	1,738	1,209	593	247	218	478	23,641	2,269
2013	6,388	2,683	3,031	2,895	1,546	849	464	250	592	36,484	2,261
2014	11,634	4,918	2,827	2,939	1,791	1,236	669	211	250	61,339	2,610
2015	6,714	9,495	2,831	1,591	1,549	926	520	275	221	24,508	2,280
2016	9,034	12,011	5,832	1,273	822	909	395	220	146	51,686	2,648

Table 5.7. Numbers at age (millions) of Western Baltic spring spawning herring at age (winter rings) from acoustic surveys 1992 to 2016. The 1999 survey was incomplete due to the lack of participation by RV "Dana".

Year/Age	1	2	3	4	5	6	7	8+	Total	3+ group
1992	277	2,092	1,799	1,593	556	197	122	20	10,509	4,287
1993	103	2,768	1,274	598	434	154	63	13	5,779	2,536
1994	5	413	935	501	239	186	62	34	3,339	1,957
1995	2,199	1,887	1,022	1,270	255	174	39	21	6,867	2,781
1996	1,091	1,005	247	141	119	37	20	13	2,673	577
1997	128	715	787	166	67	69	80	77	2,088	1,245
1998	138	1,682	901	282	111	51	31	53	3,248	1,428
1999	1,367	1,143	523	135	28	3	2	1	3,201	691
2000	1,509	1,891	674	364	186	56	7	10	4,696	1,295
2001	66	641	452	153	96	38	23	12	1,481	774
2002	3,346	1,576	1,392	524	88	40	18	19	7,002	2,081
2003	1,833	1,110	395	323	103	25	12	5	3,807	864
2004	1,668	930	726	307	184	72	22	18	3,926	1,328
2005	2,687	1,342	464	201	103	84	37	21	4,939	910
2006	2,081	2,217	1,780	490	180	27	10	0.1	6,791	2,487
2007	3,918	3,621	933	499	154	34	26	14	9,200	1,661
2008	5,852	1,160	843	333	274	176	45	44	8,839	1,715
2009	565	398	205	161	82	85	39	65	1,602	638
2010	999	511	254	115	65	24	28	34	2,030	519
2011	2,980	473	259	163	70	53	22	46	4,067	614
2012	1,018	1,081	236	87	76	33	14	60	2,605	505
2013	49	627	525	53	30	12	8	15	1,319	643
2014	513	415	176	248	28	37	26	42	1,798	556
2015	1,949	1,244	446	224	171	82	89	115	4,322	1,127
2016	425	255	381	99	40	40	12	28	1,483	600

Table 5.8. Numbers at age (millions) and SSB (thousands of tonnes) of West of Scotland autumn spawning herring at age (winter rings) from acoustic surveys 1993 to 2016. In 1997 the survey was carried out one month early in June as opposed to July when all the other surveys were carried out.

Year/Age	1	2	3	4	5	6	7	8	9+	SSB:
1993	3	750	681	653	544	865	284	152	156	866
1994	494	542	608	286	307	268	407	174	132	534
1995	441	1,103	473	450	153	187	169	237	202	452
1996	41	577	803	329	95	61	77	78	115	370
1997	792	642	286	167	66	50	16	29	24	141
1998	1,221	795	667	471	179	79	28	14	37	376
1999	534	322	1,389	432	308	139	87	28	35	460
2000	448	316	337	900	393	248	200	95	65	500
2001	313	1,062	218	173	438	133	103	52	35	359
2002	425	436	1,437	200	162	424	152	68	60	549
2003	439	1,039	933	1,472	181	129	347	114	75	739
2004	564	275	760	442	577	56	62	82	76	396
2005	50	243	230	423	245	153	13	39	27	168
2006	112	835	388	285	582	415	227	22	59	472
2007	0	126	294	202	145	347	243	163	32	299
2008	48	233	912	669	340	272	721	366	264	788
2009	346	187	264	430	374	219	187	500	456	579
2010	425	489	398	150	143	95	63	48	188	253
2011	22	185	733	451	204	220	199	113	263	458
2012	792	179	729	471	241	107	107	56	105	375
2013	0	137	320	600	162	69	61	24	37	256
2014	1031	243	218	469	519	143	30	19	11	272
2015	0	122	325	650	378	442	83	23	2	387
2016	0	30	108	88	112	79	62	6	1	88

Table 5.9. Numbers at age (winter rings, millions) and SSB (thousands of tonnes) of the Malin Shelf acoustic survey (VIaN-S, VIIb,c) time series from 2008 to 2016.

Year/Age	1	2	3	4	5	6	7	8	9+	SSB:
2008	312	290	998	720	363	331	744	386	274	842
2009	928	265	274	444	380	225	193	500	456	593
2010	300	376	374	242	173	146	102	100	297	366
2011	63	257	900	485	213	228	205	113	264	494
2012	796	548	832	518	249	115	111	57	105	427
2013	0	212	435	672	195	71	61	29	37	282
2014	1031	281	243	502	534	148	33	19	13	285
2015	0	212	397	747	423	476	90	24	2	430
2016	0	30	108	88	112	79	62	6	1	88

Table 5.10. Sprat in the North Sea (ICES Subarea IV): Abundance, biomass, mean weight and mean length by age and maturity (i = immature, m = mature) from the summer 2016 North Sea acoustic survey (HERAS).

Age	Abundance (million)	Biomass (1000 t)	Mean weight (g)	Mean length (cm)
0i	24 792	24	0.98	5.1
1i	26 425	183	6.93	9.5
1m	32 173	317	9.85	10.7
2i	2 305	24	10.55	11.0
2m	31 013	428	13.82	12.0
3i	321	4	12.71	11.5
3m	7 086	128	18.07	13.4
4m	473	8	17.91	13.9
5m	0	0		
6m	0	0		
Immature	**53 844**	**236**	**4.38**	**7.5**
Mature	**70 745**	**882**	**12.47**	**11.6**
Total	**124 588**	**1 118**	**8.78**	**8.8**

Table 5.11. Sprat in the North Sea (ICES Subarea IV): Time-series of abundance and biomass as obtained from the summer North Sea acoustic survey (HERAS) time series 2000-2016. The surveyed area has expanded over the years. Only figures from 2004 and onwards are broadly comparable. In 2003, information on sprat abundance is available from one nation only.

	Abundance (million)					Biomass (1000 t)				
Year/Age	0	1	2	3+	Sum	0	1	2	3+	Sum
2016	24 792	58 599	33 318	7 880	124 588	24	500	453	141	1118
2015	198	26 241	22 474	9 799	58 711	0	239	312	161	712
2014	5 828	58 405	20 164	3 823	88 219	9	429	228	62	728
2013	454	9 332	6 273	1 600	17 660	2	71	74	25	172
2012	7 807	21 912	12 541	3 205	45 466	27	177	150	55	409
2011	0	26 536	13 660	2 430	42 625	0	212	188	44	444
2010	1 991	19 492	13 743	798	36 023	22	163	177	14	376
2009	0	47 520	16 488	1 183	65 191	0	346	189	21	556
2008	0	17 165	7 410	549	25 125	0	161	101	9	271
2007	0	37 250	5 513	1 869	44 631	0	258	66	29	353
2006*	0	21 862	19 916	760	42 537	0	159	265	12	436
2005*	0	69 798	2 526	350	72 674	0	475	33	6	513
2004*	17 401	28 940	5 312	367	52 019	19	267	73	6	366
2003*	0	25 294	3 983	338	29 615	0	198	61	6	266
2002	0	15 769	3 687	207	19 664	0	167	55	4	226
2001	0	12 639	1 812	110	14 561	0	97	24	2	122
2000	0	11 569	6 407	180	18 156	0	100	92	3	196

*** re-calculated using FishFrame.**

Table 5.12. Sprat in ICES Division IIIa: Abundance, biomass, mean weight and length by age and maturity from the summer 2016 North Sea acoustic survey (HERAS).

Age	Abundance (million)	Biomass (tonnes)	Mean weight (g)	Mean length (cm)
0i	0	0		
1i	5	38	7.0	9.5
1m	0	0		
2i	671	8 652	12.9	12.2
2m	0	0		
3m+	280	4 826	17.2	13.3
Immature	677	8 690	12.8	12.2
Mature	280	4 826	17.2	13.3
Total	957	13 516	14.1	12.5

Table 5.13. Sprat in ICES Division IIIa: Time-series of sprat abundance and biomass as obtained from the summer North Sea acoustic survey (HERAS) time series 2006-2016.

	Abundance (million)					Biomass (kt)				
Year/Age	0	1	2	3+	Sum	0	1	2	3+	Sum
2016	0.0	5.4	671.2	280.0	956.5	0.0	0.0	8.7	4.8	13.5
2015	0.3	840.8	202.0	342.6	1 385.8	0.0	9.6	2.7	6.2	18.5
2014	29.6	614.5	109.8	159.4	913.3	0.1	4.8	1.8	3.4	10.1
2013	1.4	14.5	68.8	448.6	533.3	0.0	0.2	1.2	9.6	10.9
2012	0.3	123.9	290.1	1 488.0	1 902.3	0.0	1.2	5.0	31.4	37.6
2011	0.0	45.4	546.9	981.9	1 574.2	0.0	0.5	9.1	17.8	27.5
2010	0.0	836.1	343.8	376.3	1 556.2	0.0	7.3	4.9	6.4	18.6
2009	0.0	169.5	432.4	1 631.9	2 233.8	0.0	1.8	6.5	28.3	36.6
2008	0.0	23.0	457.8	291.2	772.0	0.0	0.2	6.3	5.8	12.3
2007	0.0	5 611.9	323.9	382.9	6 318.7	0.0	47.9	3.8	6.5	58.2
2006	86.0	61.3	1 451.9	653.0	2 252.2	0.3	0.6	21.2	11.5	33.6

Table 5.14. North Sea autumn spawning herring. Total abundance, biomass, mean weight and percent mature by strata. Strata numbers corresponds to numbering in Figure 5.1.

Strata	Abundance (mill)	Biomass (kt)	Mean weight (g)	% Mature
11	800	136	170.4	72
21	640	3	4.3	0
31	182	12	64.3	2
41	270	21	76.3	6
51	10 495	40	3.8	0
61	3 959	31	7.9	0
71	1 748	12	7.0	0
81	943	44	46.4	15
91	12 970	1 658	127.8	77
101	692	58	84.4	47
111	3 049	625	205.0	83
121	1 583	266	168.0	82
131	12 486	438	35.1	17
141	1 798	162	90.1	24
151	70	4	50.8	6

Table 5.15. Western Baltic spring spawning herring. Total abundance, biomass, mean weight and percent mature by strata. Strata numbers corresponds to numbering in Figure 5.1.

Strata	Abundance (mill)	Biomass (kt)	Mean weight (g)	% Mature
11	221	40	180.1	81
21	223	1.6	7.0	0
31	179	12.3	68.4	0
41	400	35.1	87.9	44
141	178	26	145.8	53
151	282	10.7	37.8	9

Table 5.16. Malin shelf and VIaN herring. Total abundance, biomass, mean weight and percent mature by strata. Strata numbers corresponds to numbering in Figure 5.1. The VIaN herring geographic subset is comprised of strata marked with *.

Strata	Abundance (mill)	Biomass (kt)	CV	Mean weight (g)	% Mature
1a*	68	12	0.7	177.0	99%
1b*	55	9	0.4	161.0	98%
2*	0	0	-	-	-
3*	283	53	0.3	186.0	100%
4*	79	14	0.4	182.1	100%
5	0	0	-	-	-
6	0	0	-	-	-

Table 5.17. North Sea sprat and Div. IIIa sprat. Total abundance, biomass, mean weight and percent mature by strata. Strata numbers corresponds to numbering in Figure 5.1.

Stock	Strata	Abundance (mill)	Biomass (t)	Mean weight (g)	% Mature
Div. IIIa sprat	21	957	13 516	14.1	29
	31	0	0	-	-
	41	0.001	0.017	12.3	0
North Sea sprat	11	0	0	-	-
	51	55 722	441 419	7.9	47
	61	20 147	238 440	11.8	69
	71	11 875	103 375	8.7	67
	81	17 418	221 690	12.7	84
	91	1 477	16 337	11.1	93
	101	508	4169	8.2	100
	111	0	0	-	-
	121	0	0	-	-
	131	16 758	82 289	4.9	36
	141	0	0	-	-
	151	817	11 164	13.7	12.3

Table 5.18. Length of track used in analysis, number of fish ages used in estimates and transect spacing for each strata in the 2016 survey. Number of ages cannot be summed for all strata to give total number of ages for the survey as haul information may have been used in more than one stratum.

Strata	Track length analysed (n.mi)	Number herring ages	Number sprat ages	Transect spacing (nmi)
1a	396	260	-	15
1b	188	139	-	7.5
2	218	0	-	-
3	139	483	-	15
4	131	241	-	15
5	385	0	-	15
6	401	0	-	15
11	859	677	-	15
51	353	312	672	25
61	119	160	236	-
71	263	207	184	15
81	462	133	227	35
91	1614	2447	94	15
101	90	116	31	15
111	1114	1060	-	7.5
121	661	790	-	7.5
131	428	395	414	37.5
141	1128	489	-	15
21	192	3264	930	10
31	92			10
41	215			17.5
151	411			15

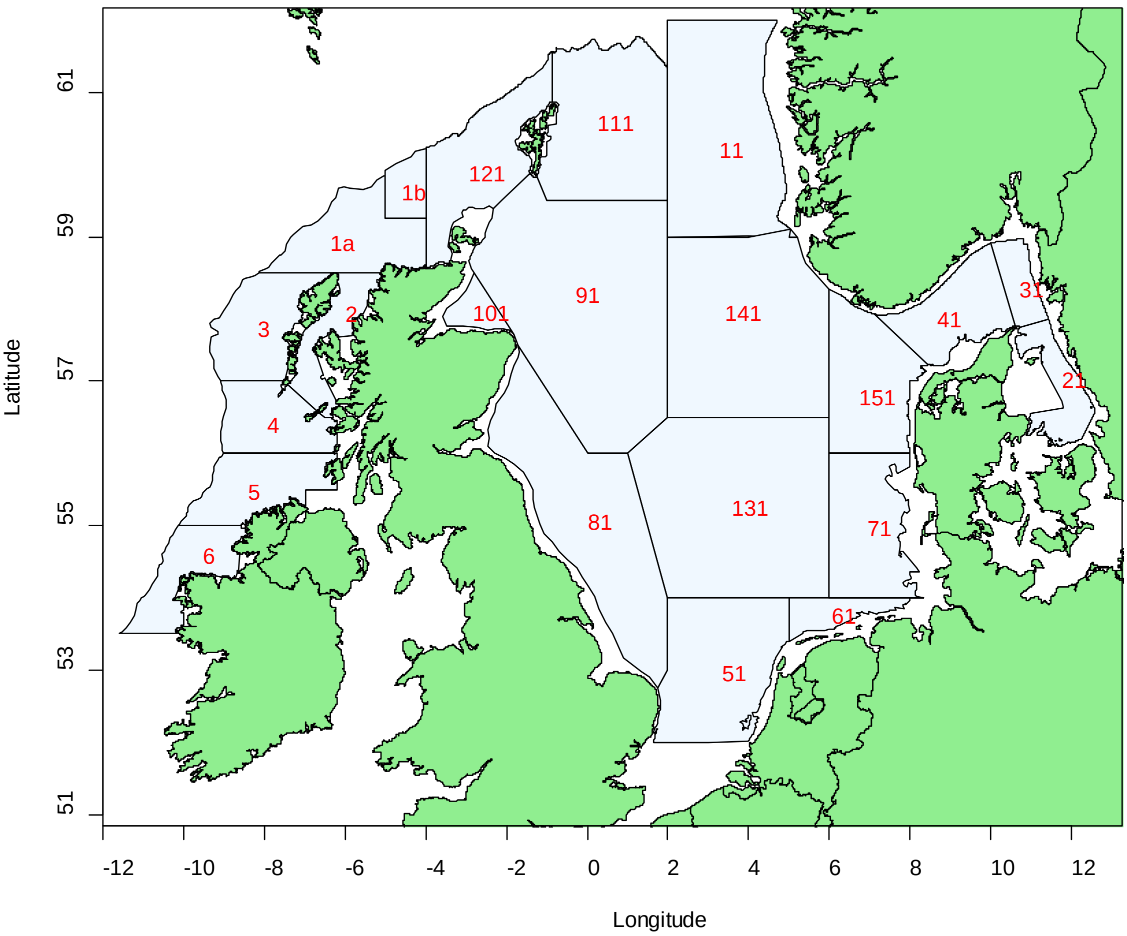


Figure 5.1. Strata used in the HERAS survey 2016.

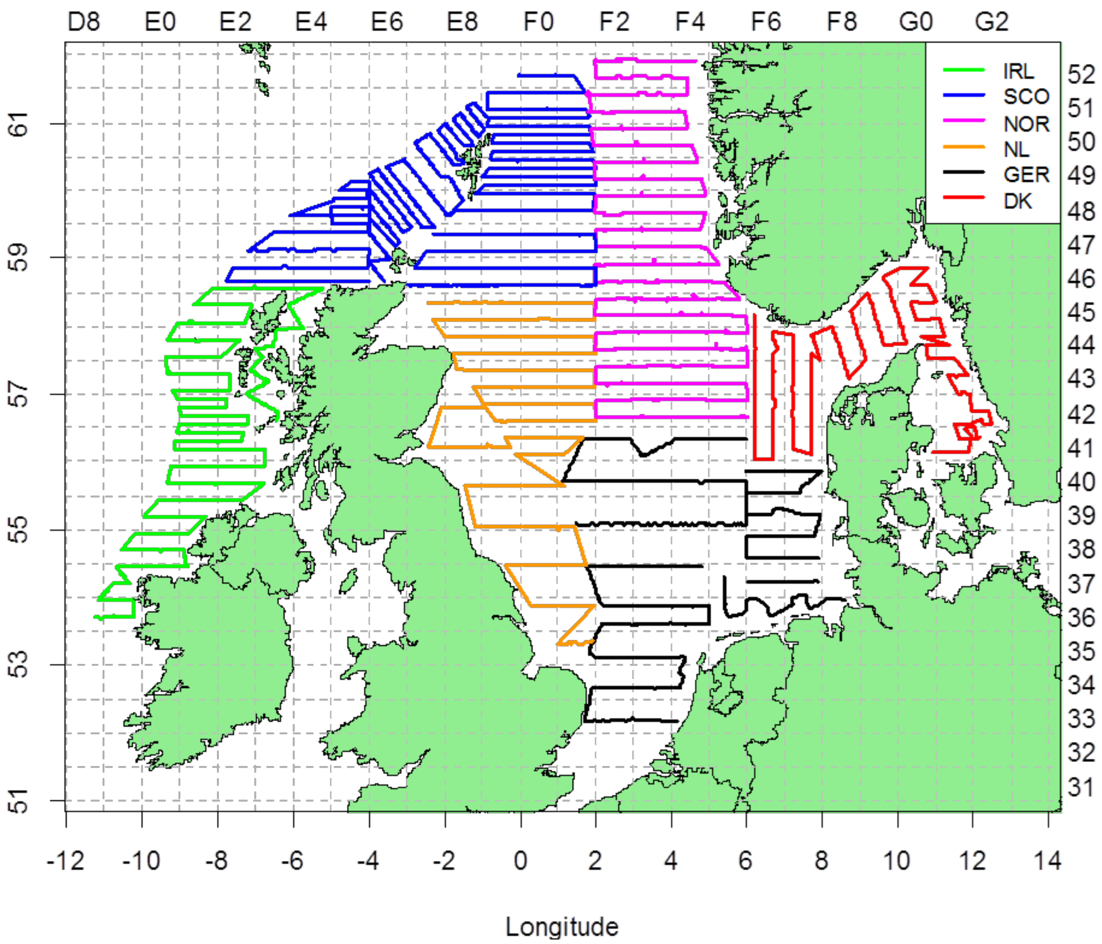


Figure 5.2. Survey area coverage in the pelagic acoustic surveys in 2016 and individual vessel tracks by nation (IRL = Celtic Explorer; SCO = Scotia and Commercial Charter; NOR = Johan Hjort; DK = Dana; NL = Tridens; GER = Solea).

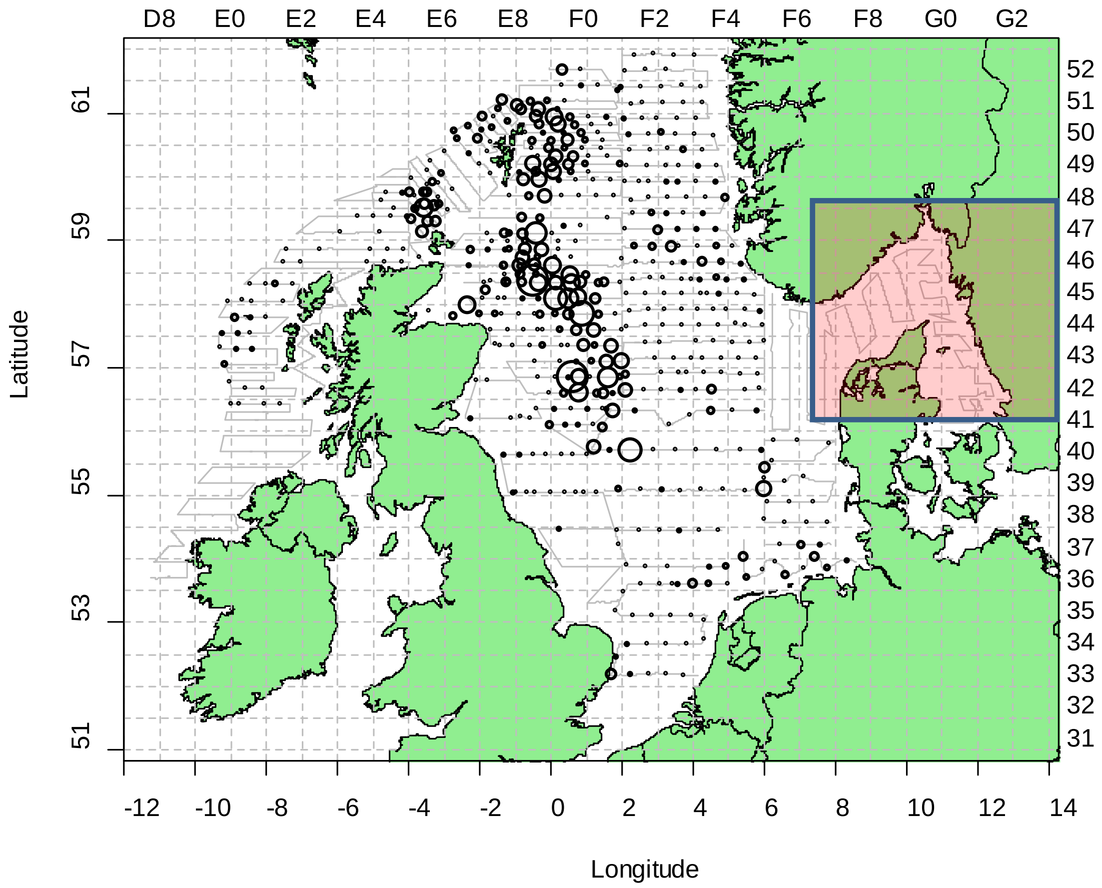


Figure 5.3a. Distribution of NASC attributed to herring in HERAS in 2016. Cruise tracks are outlined in light grey with circles representing size and location of herring aggregations. NASC values are resampled at 15 nm intervals along the cruise track. NASC in the area covered by Denmark are displayed in Figure 5.3b. Largest bubble corresponds to NASC = 4029 m2/nmi2.

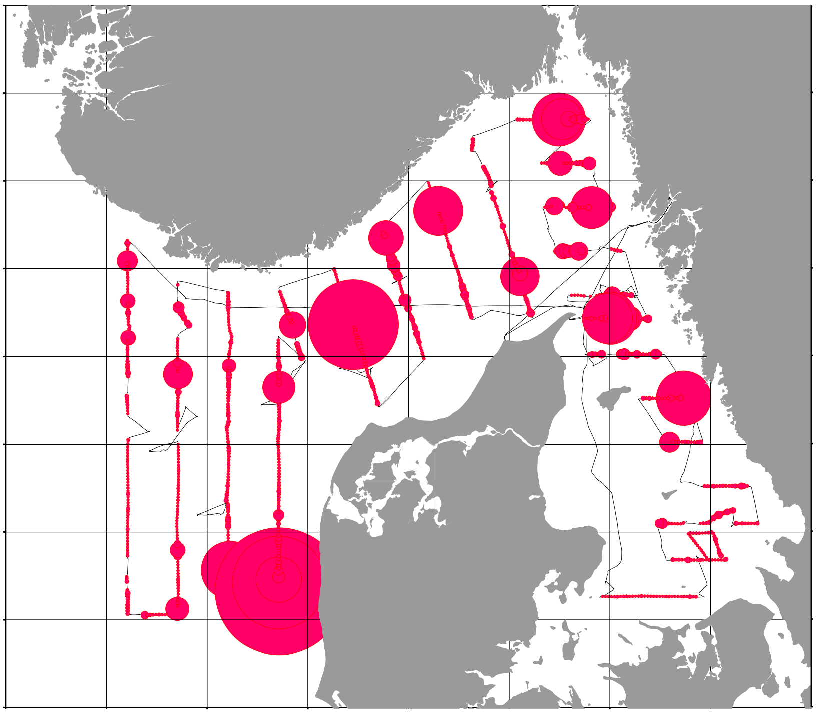


Figure 5.3b. Distribution of herring in HERAS in 2016 in area covered by Denmark. circles representing size and location of herring aggregations as herring numbers relative to total NASC per EDSU.

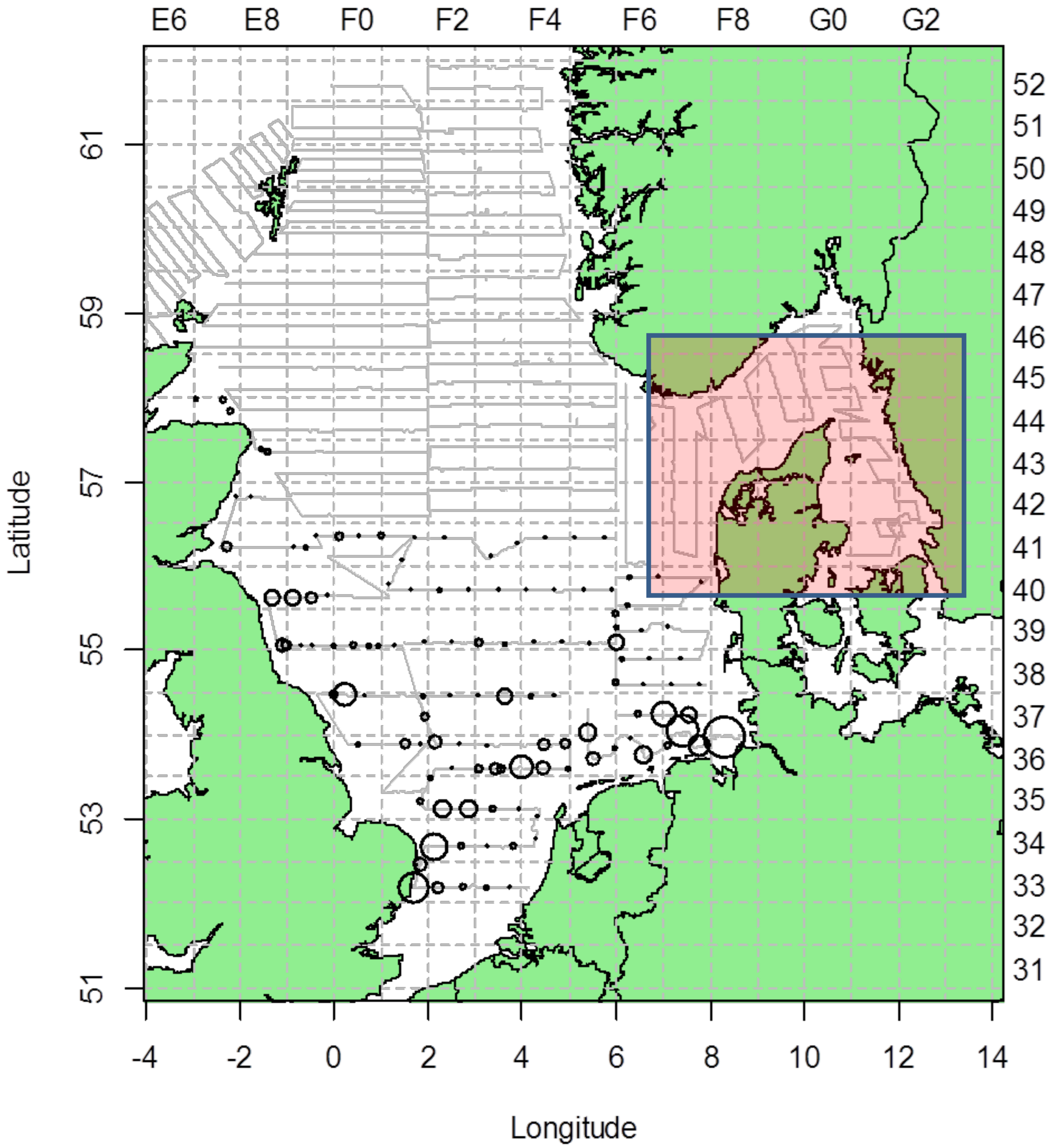


Figure 5.4a. Distribution of NASC attributed to sprat in HERAS in 2016. Cruise tracks are outlined in light grey with circles representing size and location of sprat aggregations. NASC values are resampled at 10 nm intervals along the cruise track. Distribution of sprat within the area covered by Denmark (red box) are presented in figure 5.4b. Largest bubble corresponds to NASC = 4687 m2/nmi2

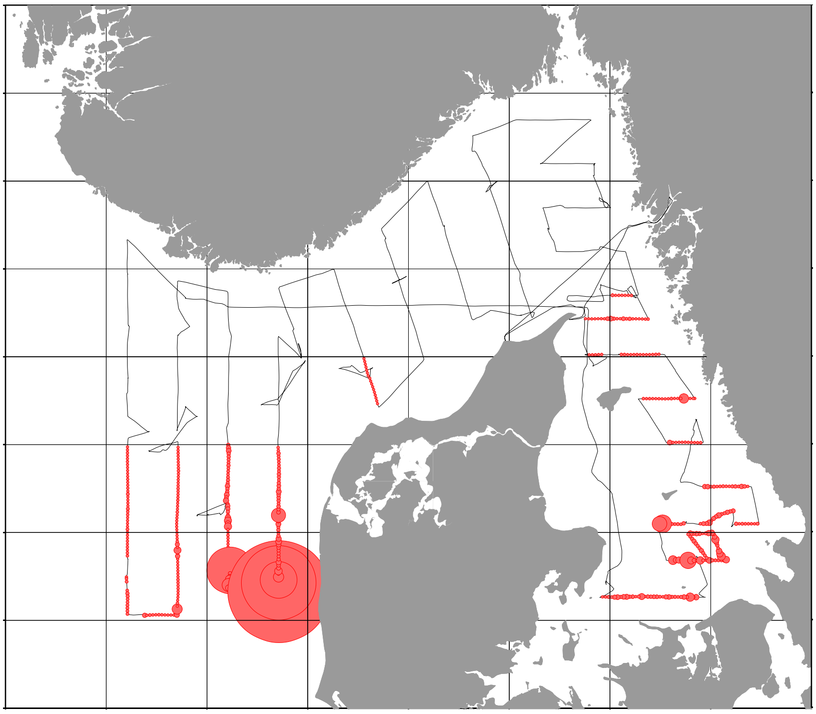


Figure 5.4b Distribution of sprat in strata covered by Denmark. Bubbles are scaled to the number of sprat relative to total NASC per EDSU.

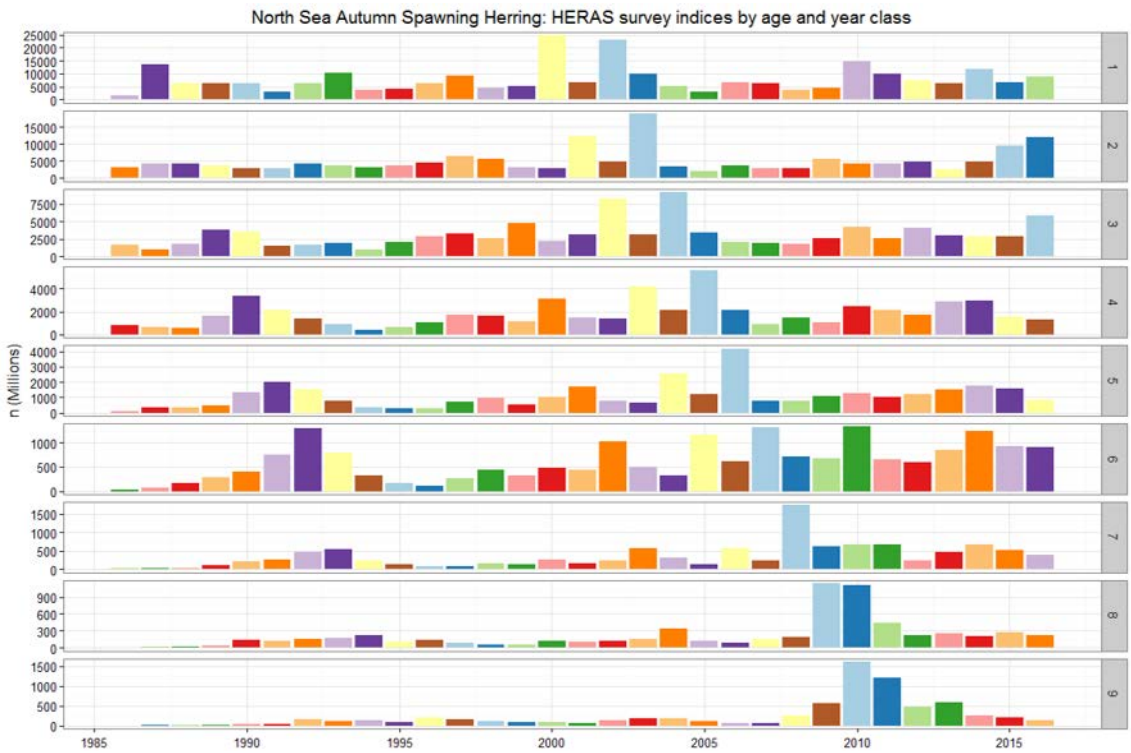


Figure 5.5. North Sea autumn spawning Herring: HERAS indices (millions) by age (winter rings) and year class from the acoustic surveys 1986-2016. Age 9 includes ages 9 and older. Note diverging scales of abundance between ages.

Figure 5.6. Western Baltic spring spawning Herring: HERAS indices (millions) by age (winter rings) and year class from the acoustic surveys 1992-2016. Age 8 includes ages 8 and older. Note diverging scales of abundance between ages.

Figure 5.7. West of Scotland (VIaN) autumn spawning herring: HERAS indices (millions) by age (winter rings) and year class from the acoustic surveys 1993-2016. Age 9 includes ages 9 and older.

Figure 5.8. Malin Shelf Herring (VIaN-S, VIIb,c): HERAS indices (millions) by age (winter rings) and year class from the acoustic surveys 2008-2016. Age 9 includes ages 9 and older.

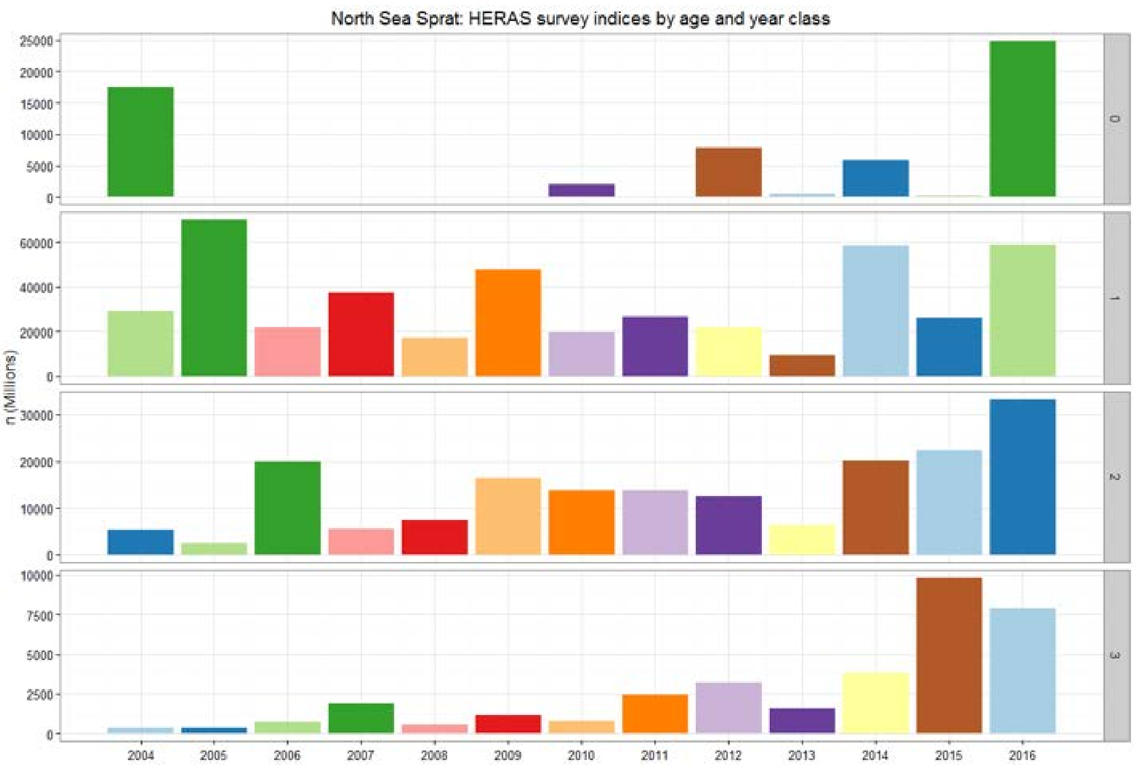


Figure 5.9. North Sea Sprat: HERAS indices (millions) by age (winter rings) and year class from the acoustic surveys 2004-2016. Age 3 includes ages 3 and older. Note diverging scales of abundance between ages.

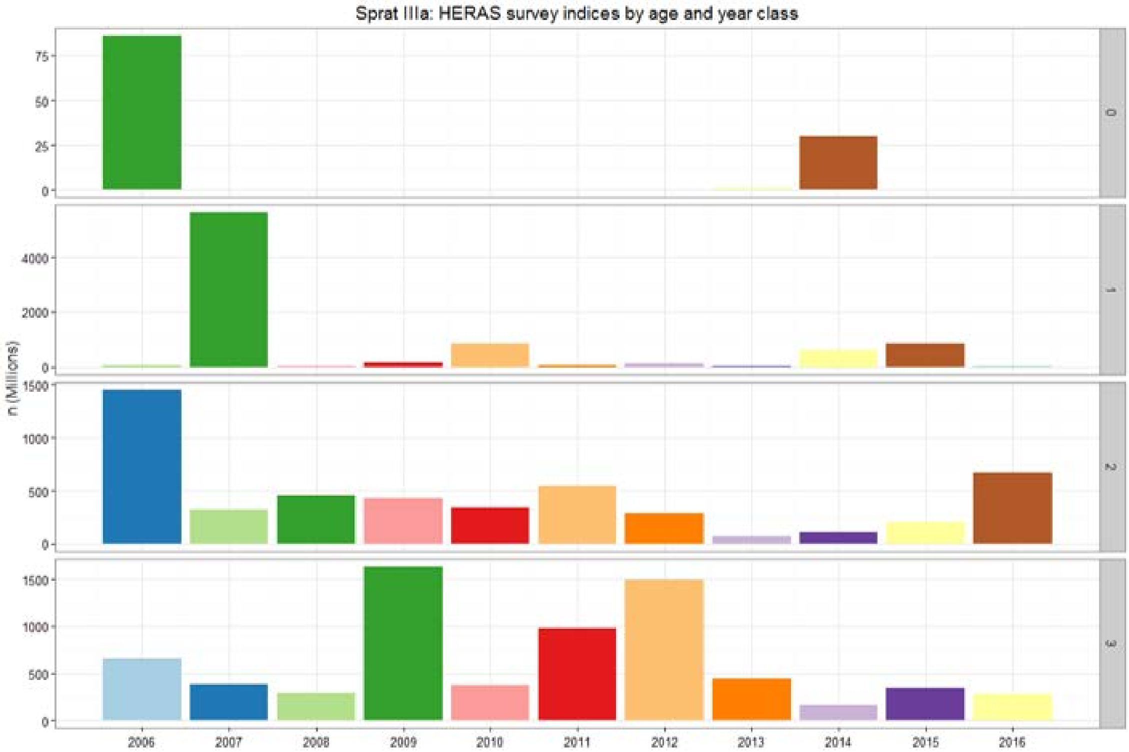


Figure 5.10. Sprat in Division IIIa: HERAS indices (millions) by age (winter rings) and year class from the acoustic surveys 2006-2016. Age 3 includes ages 3 and older. Note diverging scales of abundance between ages.

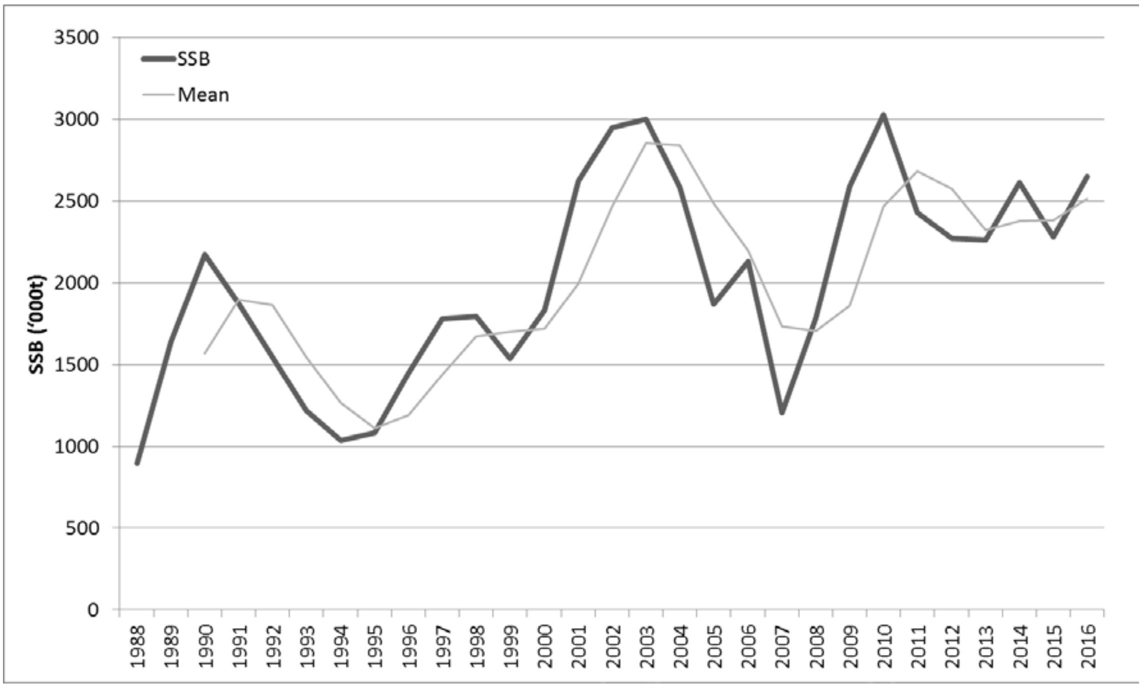


Figure 5.11. Time series of SSB of North Sea autumn spawning herring with three year running mean.

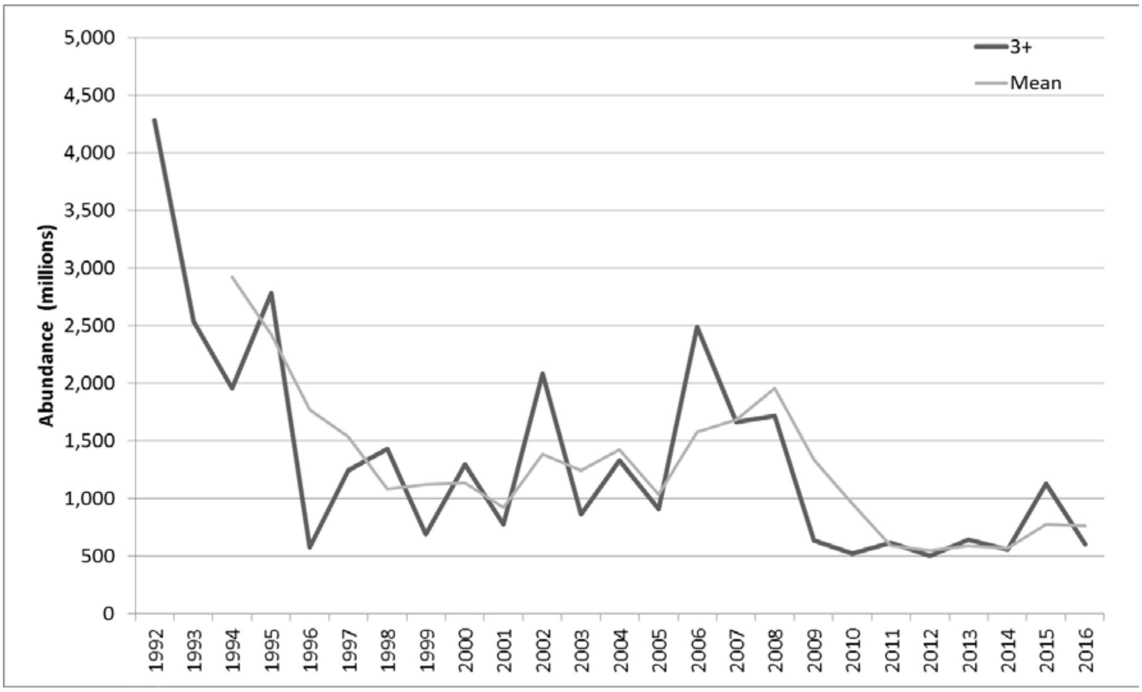


Figure 5.12. Time series of 3+ abundance of Western Baltic spring-spawning herring with three year running mean.

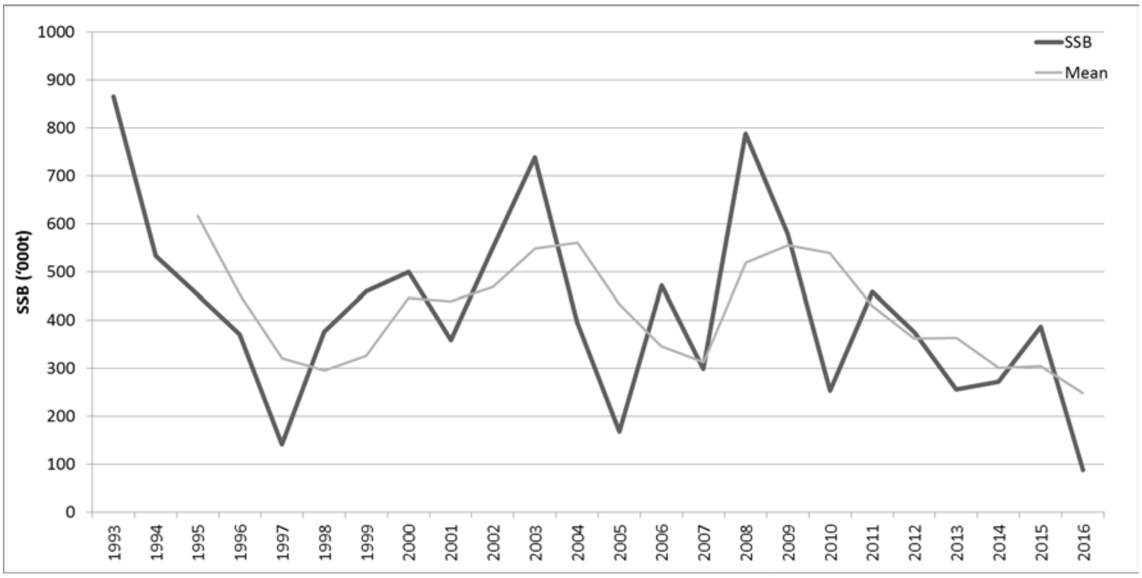


Figure 5.13. Time series of SSB of West of Scotland herring (geographical subset of Malin Shelf herring) with three year running mean.

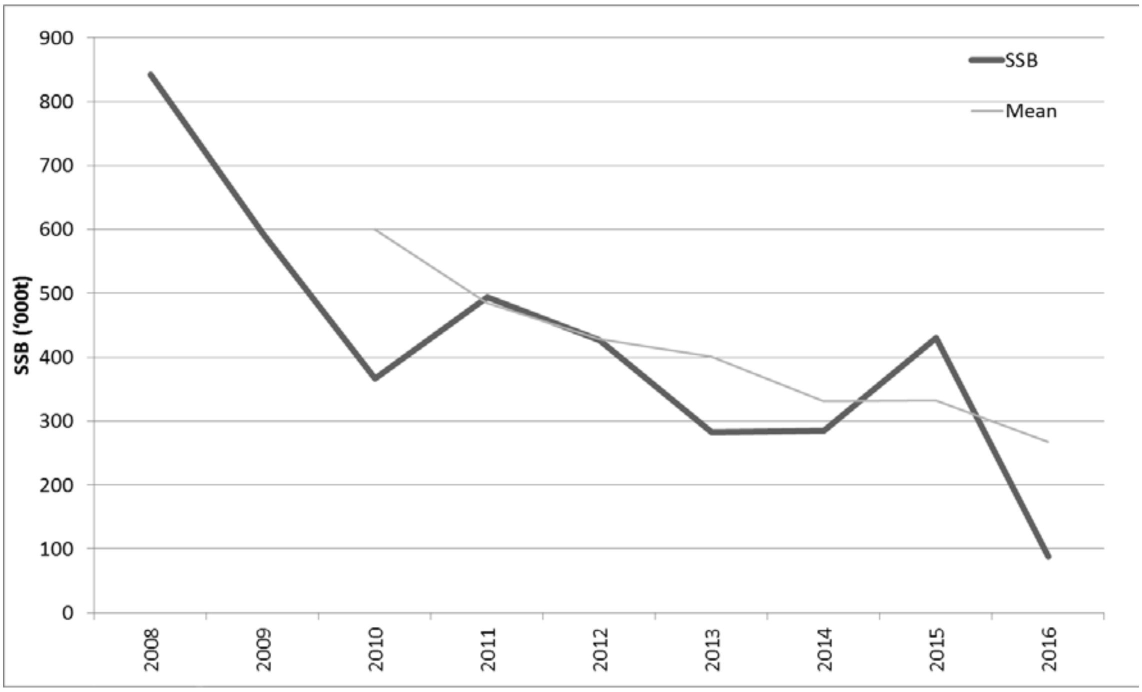


Figure 5.14. Time series of SSB of Malin Shelf herring with three year running mean.

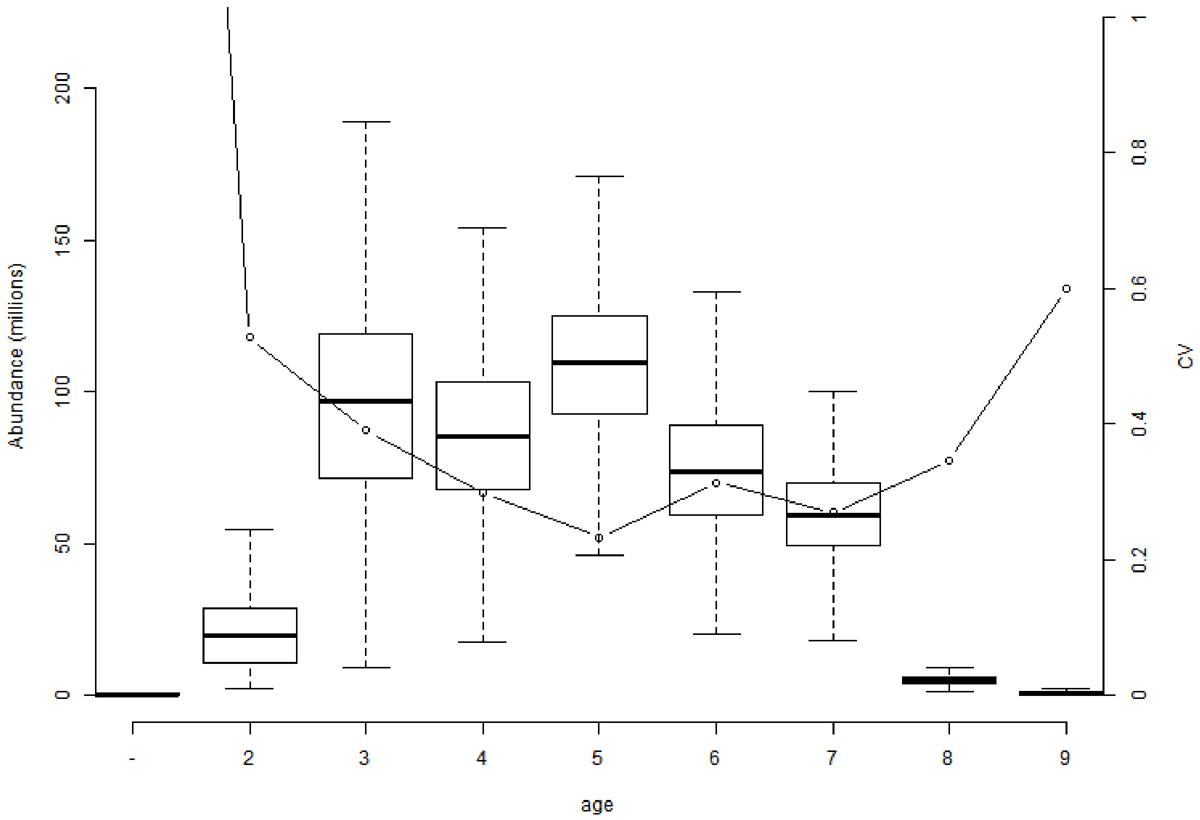


Figure 5.15. Malin Shelf Herring 2016. Abundance at age with associated uncertainty estimates.

Annex 4d: International Ecosystem Summer Survey in the Nordic Seas (IESSNS)

Survey Summary table	
Name of the survey (abbreviation):	IESSNS
Summary:	
In 2016, the survey include five vessels (1 research vessel and 4 commercial vessels) from four nations surveying more than 3 million km^2 in Nordic seas during the period from July 1-31 2016. The weather was good and did not cause any problems. 3 of 4 commercial vessels had previously participated in the survey. The commercial vessel participating for the first time in IESSNS (M Ytterstad) had previously participated in other scientific survey for Institute of Marine Research, Bergen. All vessels used a standardized trawl, including rigging, and trawl operation procedures. Acoustic data are analysed with regards to presence and abundance of herring and blue whiting only, from the surface to 500m depth.	
	Description
Survey design	Stratified design with eight permanent and two dynamic strata. Each stratum has a random starting point and fixed spacing between stations. Permanent strata are constant between years and cover the core mackerel distribution area in the Norwegian Sea and in the Icelandic EEZ. The dynamic zones are located at westward and northward mackerel distribution range periphery. Effort varies between strata. A combination of spatial variance in mackerel abundance, in years 2010-2014, and available survey time determines effort. Effort increase as spatial variability in abundance increases.
Index Calculation method	Age-segregated density index is calculated using stratified approach. The survey area is split into 10 strata, for each stratum the average density (kg km^{-2}) is calculated and multiplied by stratum area.
Random / systematic error issues	Not an issue.
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	The weather was good and no incidences of degraded echogram quality by bubble sweep down. No corrections made.
Extinction (shadowing)	Not an issue.
Blind zone	This is an issue for herring in the surface 10 m – 15 m. No attempts made to correct for loss of herring in the blind zone.
Dead zone	Not an issue.
Allocation of backscatter to species	Only allocated backscatter identified as herring or blue whiting. Identification according to standard procedure of echogram footprint, target strength, backscatter strength, position in water column, geographical location, and biological sampling.
Target strength	Blue whiting: TS = 20 log(L) – 65.2 dB (rev. acc. ICES CM 2012/SSGESST:01) Herring: TS = 20.0 log(L) – 71.9 dB
Calibration	Done according to standard procedure by all vessels prior to survey.

Working Document to

ICES Working Group on Widely Distributed Stocks (WGWIDE), ICES HQ, Copenhagen, Denmark, 31 August – 6 September 2016

Cruise report from the International Ecosystem Summer Survey in the Nordic Seas (IESSNS) with M/V "M. Ytterstad", M/V "Vendla", M/V "Tróndur í Gøtu", M/V "Finnur Fríði" and R/V "Árni Friðriksson", 1 – 31 July 2016

Leif Nøttestad, Valantine Anthonypillai, Øyvind Tangen, Åge Høines, Kjell Rong Utne
Institute of Marine Research, Bergen, Norway

Guðmundur J. Óskarsson, Anna Heiða Ólafsdóttir, Sigurður Þór Jónsson
Marine Research Institute, Reykjavik, Iceland

Jan Arge Jacobsen, Leon Smith
Faroe Marine Research Institute, Tórshavn, Faroe Islands

Teunis Jansen, Søren Post
Greenland Institute of Natural Resources, Nuuk, Greenland

Contents

1 Executive summary

The International Ecosystem Summer Survey in the Nordic Seas (IESSNS) was performed within only four weeks from 1st to 31st of July 2016 on five vessels from Norway (2), Iceland (1), Faroe Islands (1) and Greenland (1). A standardised pelagic trawl swept area method was used to obtain abundance indices and study the spatial distribution of NEA mackerel (*Scomber scombrus*) in relation to other pelagic fish stocks, ecological and environmental factors in the Nordic Seas as in recent years. One of the main objectives is to provide age-disaggregated abundance indices on an annual basis with uncertainty estimates for NEA mackerel applicable as a tuning series in the stock assessment. In 2016 we also aimed at getting acoustical abundance estimation of blue whiting (*Micromesistius poutassou*) and Norwegian spring-spawning (NSS) herring (*Clupea harengus*).

The total swept area biomass index of NEA mackerel in summer 2016 was 10.2 million tonnes distributed over an area of 3.0 million square kilometres in the Nordic Seas. The estimate in 2016 is 2.5 million tonnes higher (32.5%) than in 2015 (7.7 million tonnes), when it was distributed over an area of 2.7 million square kilometres. The 2011-year class contributed with 20% (in numbers) followed by the 2010- and 2014 year classes with 17% each in numbers. The 2012 year class had 11%. Altogether 55% of the estimated number of mackerel was less than 6 years old. The internal consistency plot for age-disaggregated year classes has improved since the benchmark in March 2014 by the inclusion of three more survey years. This is especially apparent for younger ages. There is now good internal consistency for 1-10 years old mackerel, and the internal consistency has also improved between age 5 and 6.

Mackerel was observed in most of the surveyed area, and the zero boundaries were found in the western and the northern areas. The zero boundary was not found to the east in the southern Barents Sea nor in the southeastern areas (towards the North Sea/Shetland). The mackerel was present in higher quantities in the northern, northwestern and western regions including Icelandic and Greenland waters of the surveyed area in 2016 compared to last year.

Acoustical measurements of Norwegian spring-spawning (NSS) gave abundance index of age 4+ of 19.3 billions, corresponding to 6.57 million tonnes. This is comparable to the May (IESNS) survey index in 2016 of 18.3 billions (4.9 million tonnes). The 2004 year class dominated with 23% of the biomass. The NSS herring was mainly found north of the Faroe Islands, to the east and north off Iceland and in the Jan Mayen zone. Low concentrations were found in the central, northern and eastern areas of the Norwegian Sea.

The spatio-temporal overlap between NEA mackerel and NSS herring in July-August 2016 was highest in the south-eastern, southern and south-western part of the Norwegian Sea. Herring was most densely aggregated in areas where zooplankton concentrations where high compared to other regions. Mackerel, on the other hand, was distributed in most of the surveyed area, and in areas with more varying zooplankton concentrations.

The acoustical measurements and dedicated trawling on deeper registrations provided a robust estimate of blue whiting abundance in Nordic Sea and is considered as an establishment of new time-series possibly applicable for tuning in the analytical stock assessment in the future. The total biomass of blue whiting was estimated to be 2.28 million tonnes (29.8 billion individuals), which is higher than the estimate from IESNS in May-June 2016 (1.55 million tonnes and 20.0 billion individuals) and slightly lower than the estimate from the IBWSS spawning survey in March-April 2016 (2.87 million tonnes and 34.4 billion individuals).

Lumpfish of all sizes were caught in the upper 30 m of the water column practically distributed everywhere within the total surveyed area from west of Cape Farwell in Greenland to southern part of the Barents Sea.

A few North Atlantic salmon were caught mainly in central part and western part of the Norwegian Sea during the IESSNS survey.

The sea surface temperature in July 2016 was 1-2°C warmer than in 2015 throughout most of the surveyed area and also 1-2 °C higher than the long term average for the last 20 years.

The average zooplankton index for the Norwegian Sea was slightly higher in 2016 (8.6 g m^{-2}; n=158), than in 2015 while 50% lower in Icelandic waters (4.2 g m^{-2}; n=56) and Greenlandic waters (7.4 g m^{-2}; n=21).

Opportunistic whale observations were done by the two Norwegian vessels during the survey. Overall 700 marine mammals were observed, substantially higher number of sightings than previous years. Higher densities, including large groups of fin whales, were observed in the northernmost part of the Norwegian Sea

2 Introduction

During four weeks (1st to 31st of July) in 2016, five vessels; the M/V "M. Ytterstad" and M/V "Vendla" from Norway, and M/V "Trøndur i Grøtu" from Faroe Islands, the R/V "Árni Friðriksson" from Iceland, and the M/V "Finnur Fridi" operating in Greenland waters, participated in the International Ecosystem Summer Survey in the Nordic Seas (IESSNS). The highly coordinated survey with altogether five vessels was conducted within only 4 weeks of survey time in July 2016.

The main aim of the coordinated IESSNS have been to collect data on abundance, distribution, migration and ecology of Northeast Atlantic mackerel (*Scomber scombrus*) during their summer feeding migration phase in the Nordic Seas, to be used as input to the abundance estimation of mackerel at ICES. Other major pelagic species such as Norwegian spring-spawning herring (*Clupea harengus*) and blue whiting (*Micromesistius poutassou*) have also been covered, although with less effort. But in 2016 a new primary objective during was to conduct systematic acoustic abundance estimation of both herring and blue whiting. This objective was initiated to provide an additional abundance index for these two stocks because the current indices used in the stock assessments by ICES have shown some unexplained fluctuations (ICES, WGWIDE 2016). It was considered that a relatively small increase in survey effort would accommodate a full acoustic coverage of both species during their summer feeding distribution in the Nordic Seas (Utne et al. 2012; Trenkel et al. 2014; Pampoulie et al. 2015).

Opportunistic whale observations were conducted onboard the Norwegian vessels M. Ytterstad and Vendla in order to collect data on distribution and aggregation of marine mammals in relation to potential prey species and the physical environment. The pelagic trawl survey was initiated by Norway in the Norwegian Sea in the beginning of the 1990s. Faroe Islands and Iceland have participated in the joint mackerel-ecosystem survey since 2009 and Greenland since 2013.

Swept-area abundance indices of mackerel from IESSNS have been used for tuning in the analytical assessment by ICES, WGWIDE, since the benchmark assessment in 2014. Since then, three more years have been added to the time-series, which makes it more robust. In addition, methodological and statistical changes and improvements in the survey design, inclusion of uncertainty estimates on the age-disaggregated abundance estimations using the StoX have improved the quality and consistency of the NEA mackerel abundance estimates. Details on the survey methods are published in Nøttestad et al. (2016). A preliminary estimate of the abundance of mackerel based on the swept area analyses using the StoX is presented.

3 Material and methods

Coordination of the survey was done during WGWIDE meeting in San Sebastian, Spain, WGIPS meeting in Dublin, Ireland, and by correspondence in spring and summer 2016. The participating vessels together with their effective survey periods are listed in Table 1.

Overall, the weather conditions were very calm with exceptionally good survey conditions for all the five vessels for oceanographic monitoring, plankton sampling, acoustic registrations and pelagic trawling.

During the IESSNS survey the special designed pelagic trawl, Multpelt 832, has now been applied by all participating vessels since 2012. This trawl is a product of cooperation between participating institutes in designing and constructing a standardized sampling trawl for the IESSNS. The work was lead by trawl gear scientist John Willy Valdemarsen, Institute of Marine Research (IMR), Bergen, Norway, and has been the standard for six years now (Valdemarsen et al. 2014). The design of the trawl was finalized during meetings of fishing gear experts and skippers at meetings in January and May 2011. Further discussions on modifications in standardization between the rigging and operation of Multpelt 832 was done during a trawl expert meeting in Copenhagen 17-18 August 2012, in parallel with the post-cruise meeting for the joint ecosystem survey, and then at the WKNAMMM workshop and tank experiments on a prototype (1:32) of the Multpelt 832 pelagic trawl, conducted as a sequence of trials in Hirtshals, Denmark from 26 to 28 February 2013 (ICES 2013a). The swept area methodology was also presented and discussed during the WGISDAA workshop in Dublin, Ireland in May 2013 (ICES 2013b). The standardization and quantification of catchability from the Multpelt 832 pelagic trawl was further discussed during the mackerel benchmark in Copenhagen in February 2014. Recommendations and requests coming out of the mackerel benchmark were considered and implemented during the IESSNS survey in July-August 2014 and in the surveys thereafter.

Table 1. Survey effort by each of the five vessels in the IESSNS survey in 2016. *) The number of predetermined ("fixed") trawl stations being part of the swept-area stations for mackerel in the IESSNS are shown after the total number of trawl stations.

Vessel	Effective survey period	Length of cruise track (nmi)	Trawl stations/ Fixed stations*)	CTD stations	Plankton stations
Árni Friðriksson	1/7-31/7	5481	98/82	82	79
Tróndur í Gøtu	4/7- 21/7	2922	45/39	39	38
Finnur Fríði	23/7-31/7	1908	20	20	20
Vendla	1/7-30/7	3813	91/69	70	69
M.Ytterstad	1/7-30/7	3731	87/72	73	72
Total	1/7-31/7	17856	341/262	284	278

3.1 Hydrography and Zooplankton

The hydrographical and plankton stations by all vessels combined are shown in Figure 1. Árni Friðriksson was equipped with a SEABIRD CTD sensor with a water rosette that was applied during the entire cruise. Trøndur i Gøtu was equipped with a mini SEABIRD SBE 25+ CTD sensor, and M.Ytterstad and Vendla were both equipped with SEABIRD CTD sensors and SAIV CTD sensors. Finnur Fridi operation in Greenland waters used a SEABIRD 19+V2 CTD sensor. The CTD-sensors were used for recording temperature, salinity and pressure (depth) from the surface down to 500 m, or to the bottom when at shallower depths.

All five vessels collected and recorded also oceanographic data from the surface either applying a thermosalinograph (temperature and salinity) placed at approximately 6 m depth underneath the surface or a thermograph logging or visualizing temperatures continuously near the surface throughout the survey.

Zooplankton was sampled with a WP2-net on all vessels. Mesh sizes were 180 μm (M. Ytterstad and Vendla) and 200 μm (Árni Friðriksson, Trøndur i Gøtu and Finnur Fridi). The net was hauled vertically from a depth of 200 m (or bottom depth at shallower stations) to the surface at a speed of 0.5 m/s. All samples were split in two, one half preserved for species identification and enumeration, and the other half dried and weighed. Detailed description of the zooplankton and CTD sampling is provided in the survey manual (ICES 2014b).

This year, it was possible to take all planned CTD and plankton stations. The number of stations taken by the different vessels is provided in Table 1.

Light measurements from the mast were done continuously, including during all trawl hauls, on all vessels, except onboard Árni Friðriksson. These data have not yet been analysed and therefore the results are not presented in this report, but will be reported later.

3.2 Trawl sampling

All vessels used the standardized Multpelt832 pelagic trawl (ICES, 2013a; Valdemarsen et al. 2014) for trawling, both for fixed surface stations and for trawling at greater depths to confirm acoustic registrations. Standardization of trawl deployment was emphasised during the survey as in previous years (ICES 2013a; ICES 2014c). Effective trawl width and trawl depth was monitored live by scientific personal. The properties of the Multpelt832 trawl and rigging on each vessel is reported in Table 2.

Trawl catch was sorted to the highest taxonomical level possible, usually to species for fish, and total weight per species recorded. The processing of trawl catch varied between nations as the Norwegian, Icelandic and Greenlandic vessels sorted the whole catch to species but the Faroese vessel sub-sampled the catch before sorting. Sub-sample size ranged from 100 kg (if it was clean catch of either herring or mackerel) to 200 kg (if it was a mixture of herring and mackerel). The biological sampling protocol for trawl catch varied between nations in number of specimen sampled per station (Table 3).

Table 2. Trawl settings and operation details during the international mackerel survey in the Nordic Seas from 1st to 31st of July 2016. The column for influence indicates observed differences between vessels likely to influence performance. Influence is categorized as 0 (no influence) and + (some influence).

Properties	**M. Ytterstad**	**Árni Friðriksson**	**Vendla**	**Tróndur í Gøtu**	**Finnur Fríði**	**Influ -ence**
Trawl producer	Egersund Trawl AS	Tornet/Hampiðjan (55/27)	Egersund Trawl AS	Vónin	Hampiðjan	0
Warp in front of doors	Dynex–34 mm	Dynex-34 mm	Dynex -34 mm	Dynema – 34mm	Dynex-38 mm	+
Warp length during towing	350	350	350	350	350	0
Difference in warp length port/starboard (m)	2-10	3-12	2-10	20-25	10-20	0

Weight at the lower wing ends (kg)	2×400	2×400 kg (decreased to 320 kg)	2×400	2×400	2×500	0
Weight of the groundrope chain (kg)		Tornet 1163kg/Hampiðjan 925 kg		950 kg		
Setback (m)	6 m	6	6 m	6 m	6	+
Type of trawl door	Seaflex adjustable hatches	Jupiter	Seaflex adjustable hatches	Injector F-15	T-20vf Flipper	0
Weight of trawl door (kg)	1700	2200	1700	2300	2000	+
Area trawl door (m^2)	7.5 m^2 with 75% hatches (effective 6.5 m^2)	7 m^2	7.5 m^2 with 25% hatches (effective 6.5 m^2)	6 m^2	7 with 50% hatches (effective 6.5 m^2)	+
Towing speed (knots)	4.8 (4.5-5.2)	5.0 (3.6-5.4)	4.7 (4.4-5.2)	5.0 (4.7-5.2)	4.8 (4.5-5.1)	+
Trawl height (m)	25-34	26-44 m	26-36	34.8	38-50	+
Door distance (m)	112-128	96-126 m	110-125	108.7	115 (103-125)	+
Trawl width (m)	-	-	-	-	65.3 m	+
Turn radius	5-10 degrees turn	5-10 degrees turn	5-10 degrees turn	5-10 degrees BB turn	5-10 degrees turn	+
A fish lock in front end of cod-end	Yes	Yes	Yes	Yes	Yes	+
Trawl door depth (port, starboard, m)	5-15, 10-17 m	5-28, 5-27 m	5-16, 7-18 m	7.8, 7.4	5-15, 6-18 m	+
Headline depth	0 m	0-1 m	0 m	0 m	0-1 m	+
Float arrangements on the headline	Kite +2 buoys on each wingtip	Kite + 2 buoys on wings	Kite + 2 buoys on each wingtip	Kite + 2 buoys on wingtips	Kite + 2 buoys on wingtips	+
Weighing of catch	All weighted	All weighted	All weighted	All weighted	All weighted	+

Table 3. Summary of biological sampling in the survey from 1.-31. July 2016 by the five participating countries. Numbers denote the maximum number of individuals sampled for each species for the different determinations.

	Species	Faroes	Greenland	Iceland	Norway
Length measurements	Mackerel	200/100*	100/50*	150	100
	Herring	200/100*	100/50*	200	100
	Blue whiting	200/100*	100/50*	50	100
	Other fish sp.	0	25/25*	50	25
Weighed, sexed and maturity determination	Mackerel	25	25	50	25
	Herring	25	25	50	25
	Blue whiting	25	25	50	25
	Other fish sp.	0	0	10	0
Otoliths/scales collected	Mackerel	25	25	25	25
	Herring	25	25	50	25
	Blue whiting	25	25	50	25
	Other fish sp.	0	0	0	0
Fat content	Mackerel	0	50	0	10
	Blue whiting	0	50		
	Herring	30	0	0	
Stomach sampling	Mackerel	10	20	10**	
	Herring	10	20	10**	10
	Blue whiting	10	20	10**	10
	Other fish sp.	0	0	0	10
Tissue for genotyping	Mackerel	0		0	0
	Herring	30		0	30

- *Length measurements / weighed individuals
- **Stomachs sampled at every third station

Underwater camera observations during trawling

All vessels except onboard RV Árni Friðriksson employed an underwater video camera (GoPro HD Hero 3 or 4 Black Edition, www.gopro.com) or high definition Sony camera in the trawl to observe mackerel behaviour during trawling. The camera was put in a waterproof box which tolerated pressure down to approximately 100 m depth. The goal of the video recordings was to observe and assess: individual and schooling behaviour, escapement from the cod end and through meshes, patchiness and swimming performance of mackerel. No light source was employed with cameras, hence, recordings were limited to day light hours. Video recordings were collected at 20 trawl stations between 200 mm and 400 mm mesh sizes onboard M. Ytterstad and Vendla. Onboard Trøndur i Grøtu video recordings were collected at 4 trawl stations between 1 and 2 m mesth size. Video recordings from a total of 6 trawl stations were taken by M/V Finnur Fridi in Greenland waters. Analyses of the recording material are underway and will be presented by other means when available.

3.3 Marine mammals

Opportunistic observations of marine mammals were conducted by trained scientific personnel and crew members from the bridge between 1st and 30st of July 2016 onboard the Norwegian chartered vessels M/V "M. Ytterstad" and M/V "Vendla", respectively. The priority periods of observing were during the transport stretches from one trawl station to another. Observations were done 24 h per day if the visibility was sufficient for marine mammal sightings. Digital filming and photos were taken whenever possible on each registration from scientists onboard.

3.4 Acoustics

Multifrequency echosounder

The acoustic equipment onboard M. Ytterstad and Vendla were calibrated 29th of June 2016 for 18, 38 and 200 kHz. Árni Friðriksson was also calibrated on 12th of April 2016 for the frequencies 18, 38, 120 and 200 kHz, Tróndur í Gøtu was calibrated on 30th June 2016 and Finnur Fríði was calibrated on the 19. July 2016 for 38, 120 and 200 kHz prior to the cruise. All vessels used standard hydro-acoustic calibration procedure for each operating frequency (Foote, 1987). CTD measurements were taken in order to get the correct sound velocity as input to the echosounder calibration settings.

Acoustic recordings were scrutinized to herring and blue whiting on daily basis using the post-processing software (LSSS or Echoview, see Table 4 for details of the acoustic settings by vessel). Species were identified and partitioned using catch information, characteristic of the recordings, and frequency between integration on 38 kHz and on other frequencies by a scientist experienced in viewing echograms.

To estimate the abundance from the allocated NASC-values the following target strengths (TS) relationships were used.

Blue whiting: TS = 20 log(L) – 65.2 dB (rev. acc. ICES CM 2012/SSGESST:01)
Herring: TS = 20.0 log(L) – 71.9 dB

Table 4. Acoustic instruments and settings for the primary frequency from 1st to 31st of July 2016. M/V Finnur Fridi did collect acoustic data during the survey, but they were not used in the analyses.

	M/V M. Ytterstad	R/V Árni Friðriksson	M/V Vendla	M/V Tróndur í Gøtu	M/V Finnur Fríði
Echo sounder	Simrad EK60	Simrad EK 500	Simrad EK 60	Simrad EK 60	Simrad EK 60
Frequency (kHz)	18, 38, 70, 120, 200	38, 18, 120, 200	18, 38, 70, 120, 200	38,120, 200	38,120, 200
Primary transducer	ES38B	ES38B	ES38B	ES38B	ES38B
Transducer installation	Drop keel	Drop keel	Drop keel	Hull	Hull
Transducer depth (m)	9	8	9	6	8
Upper integration limit (m)	15	15	15	7	Not used
Absorption coeff. (dB/km)	9.9	10.6	9.9	9.8	9.7
Pulse length (ms)	1.024	1.024	1.024	1.024	1.024
Band width (kHz)	2.43	2.425	2.425	2.43	
Transmitter power (W)	2000	2000	2000	2000	2000
Angle sensitivity (dB)	21.9	21.9	21.9	21.9	21.9
2-way beam angle (dB)	-21.1	-20.81	-20.6	-20.6	-20.7
TS Transducer gain (dB)	24.87	24.44	23.27	24.29	24.04
s_A correction (dB)	-0.60	-0.63	-0.65	-0.65	-0.61
alongship:	6.89	7.22	7.01	7.12	7.21
athw. ship:	6.87	7.2	7.11	7.19	7.07
Maximum range (m)	500	500 (750 in part of the survey)	500	500	500
Post processing software	LSSS	LSSS	LSSS	Sonardata Echoview 7.x	Sonardata Echoview 6.x

Multibeam sonar

M/V "M. Ytterstad" and M/V "Vendla" were equipped with the Simrad fisheries sonar SH90 (frequency range: 111.5-115.5 kHz), with a scientific output incorporated which allow the storing of the beam data for post-processing. The main objective for the continuous sonar recordings was to study the vertical distribution, school geometry and patchiness of the mackerel.

Cruise tracks

The five participating vessels followed predetermined survey lines with pre-selected surface trawl stations (Figure 1). An adaptive survey design was also adopted although to a small extent, due to uncertain geographical distribution of mackerel and herring. The main adaptation was in the Icelandic-south stratum where it was shortened southwards as the zero line of mackerel distribution had been reached. Temporal survey progression by vessel along the cruise tracks in July 2016 is shown in Figure 2. The cruising speed was between 10-13 knots if the weather permitted otherwise the cruising speed was adapted to the weather situation.

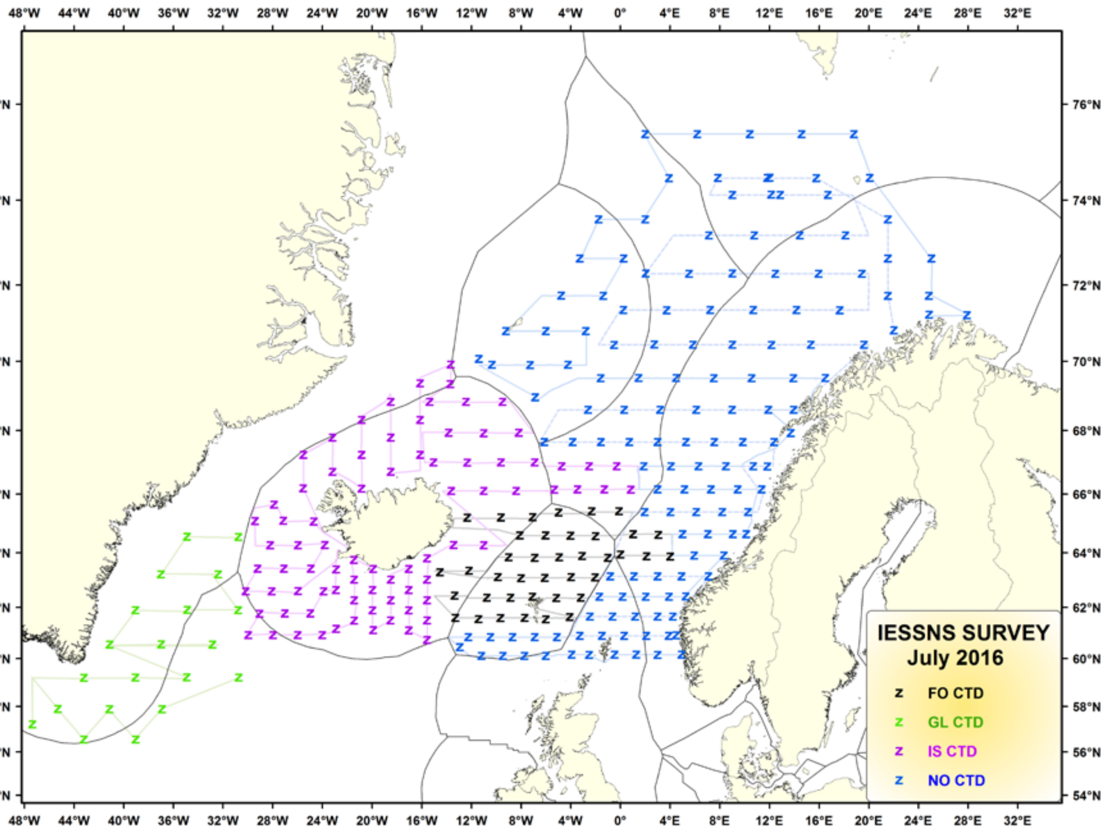


Figure 1. Fixed predetermined trawl stations included in the IESSNS July 2016. At each station a 30 min surface trawl haul, a CTD station (0-500 m) and WP2 plankton net samples (0-200 m depth) was performed. The colour codes, Arni Fridriksson (purple), Tróndur í Gøtu (black), M. Ytterstad and Vendla (blue) and Finnur Fríði (green).

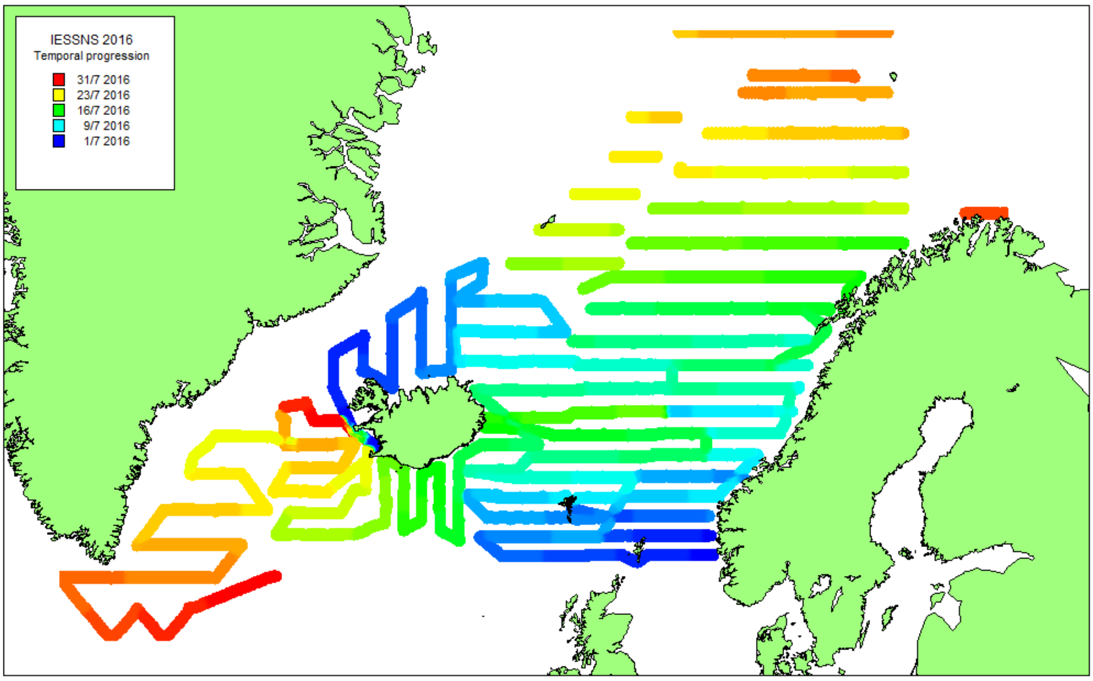


Figure 2. Temporal survey progression by vessel along the cruise tracks in July 2016: blue represents survey start (1 July) progressing to red representing the end of the survey (31 July).

3.5 StoX

StoX is open source software developed at IMR, Norway to calculate survey estimates from acoustic and swept area surveys. The software, examples and documentation can be found at: http://www.imr.no/forskning/prosjekter/stox/nb-no. The program is a stand-alone application build with Java for easy sharing and further development in cooperation with other institutes. The underlying high resolution data matrix structure ensures future implementations of e.g. depth dependent target strength and high resolution length and species information collected with camera systems. Despite this complexity, the execution of an index calculation can easily be governed from user interface and an interactive GIS module, or by accessing the Java function library and parameter set using external software like R. Various statistical survey design models can be implemented in the R-library, however, in the current version of StoX the stratified transect design model developed by Jolly and Hampton (1990) is implemented.

The acoustic biomass estimates of herring and blue whiting were calculated from the StoX software package.

An exploratory run for mackerel was also done using the swept-area option in StoX.

3.6 Swept area index and biomass estimation

The swept area estimate is based on catches in the whole area covered in the survey, or between 56°N and 76°N and 45°W and 28°E. Rectangle dimensions were 2° latitude by 4° longitude as for the calculations in 2015. However, this rectangle size is larger than what was used prior to 2015. Allocation of the biomass to exclusive economic zones (EEZs) was done in the same way as in 2010-2015 (see Annex 1).

The swept area calculations follow the same approach as in previous years. The approach is basically the same as thoroughly presented in Nøttestad et al (2016) without the collapse of strata for precision estimates. Average density (Mac_D; kg km^{-2}) is calculated by for each trawl haul with the following formula;

Mac_D = h * d * c

where h (km) is the horizontal opening of the trawl, d is distance trawled (km) and c is the total mackerel catch (kg). The horizontal opening of the trawl is vessel specific, and the average value across all hauls is calculated based on door spread (Table 5 and Table 6). The average Mac_D for all hauls within a rectangle are used to calculated the total abundance of mackerel within that rectangle. All rectangles are summarized to get total biomass estimate, and the biomass is split into number-at-age for each rectangle. This is done according to standard allocation of biomass to age according to the length distribution of the sampled fish. As there are spatial differences in length-at-age within the survey area (Ices 2014), four different age-length keys area applied (southern eastern area, northern eastern area, middle area and western area).

Table 5. Descriptive statistics for trawl door spread, vertical trawl opening and tow speed for each vessel. Two different kinds of data were analyzed, manually reported values from log books (one value per station) and digitally recorded data from trawl sensors (*). Digitally recorded data were filtered prior to calculations; for trawl door spread all values < 80 m and > 140 m were deleted and for opening vertical spread all values < 20 m and > 50 were deleted. Next, average door spread and vertical opening was calculated for each station, then the average values per station were used to calculate overall mean, maximum (max), minimum (min) and standard deviation (st.dev.) for each vessel. Number of trawl stations used in calculations is also reported. Horizontal trawl opening (**) was calculated using average vessel values for trawl door spread and tow speed (details in Table 6).

	Tróndur í Gøtu	RV Árni Friðriksson	M. Ytterstad	Vendla	Finnur Fríði
Trawl doors horizontal spread (m)					
Number of stations	39	82	72	69	20
Mean	108.7	114	119	117	116
max	114.7	126	127	125	126
min	104.4	96	104	106	103
st. dev.	4.5	4	6	5	8
Vertical trawl opening (m)					
Number of stations	37	75	72	69	20
Mean	34.8	33	31	33	43
max	38.1	44	34	36	50
min	31.8	26	27	28	38
st. dev.	2.9	4	4	4	3.5
Horizontal trawl opening (m) **					
mean	63	65.2	65	66	65.3
Speed (over ground, nmi)					
Number of stations	39	82	72	69	20
mean	5.0	5.0	4.7	4.8	4.8
max	5.2	5.4	5.2	5.3	5.1
min	4.7	3.6	4.1	4.2	4.5
st. dev.	0.12	0.3	0.3	0.3	0.2

Horizontal trawl opening was calculated using average vessel values for trawl door spread and tow speed (Table 6). The estimates in the formulae were based on a flume tank simulations in 2013

(Hirtshals, Denmark) where formulas were developed from the horizontal trawl opening as a function of door spread, for two towing speeds, 4.5 and 5 knots:

Towing speed 4.5 knots: Horizontal opening (m) = 0.441 * Doorspread (m) + 13.094

Towing speed 5.0 knots: Horizontal opening (m) = 0.3959 * Doorspread (m) + 20.094

Table 6. Horizontal trawl opening as a function of trawl door spread and towing speed. Relationship based on simulations of horizontal opening of the Multpelt 832 trawl towed at 4.5 and 5 knots, representing the speed range in the 2014 survey, for various door spread. See text for details.

Door	Towing speed (knots)					
spread (m)	4.5	4.6	4.7	4.8	4.9	5
100	57.2	57.7	58.2	58.7	59.2	59.7
101	57.6	58.1	58.6	59.1	59.6	60.1
102	58.1	58.6	59.0	59.5	60.0	60.5
103	58.5	59.0	59.5	59.9	60.4	60.9
104	59.0	59.4	59.9	60.3	60.8	61.3
105	59.4	59.9	60.3	60.8	61.2	61.7
106	59.8	60.3	60.7	61.2	61.6	62.1
107	60.3	60.7	61.2	61.6	62.0	62.5
108	60.7	61.1	61.6	62.0	62.4	62.9
109	61.2	61.6	62.0	62.4	62.8	63.2
110	61.6	62.0	62.4	62.8	63.2	63.6
111	62.0	62.4	62.8	63.2	63.6	64.0
112	62.5	62.9	63.3	63.7	64.0	64.4
113	62.9	63.3	63.7	64.1	64.4	64.8
114	63.4	63.7	64.1	64.5	64.9	65.2
115	63.8	64.2	64.5	64.9	65.3	65.6
116	64.3	64.6	65.0	65.3	65.7	66.0
117	64.7	65.0	65.4	65.7	66.1	66.4
118	65.1	65.5	65.8	66.1	66.5	66.8
119	65.6	65.9	66.2	66.6	66.9	67.2
120	66.0	66.3	66.6	67.0	67.3	67.6

4 Results

4.1 Hydrography

Overall the surface temperatures were generally 1-2°C warmer in the whole Northeast Atlantic in July 2016 compared to the average for the last 20 years based on Sea Surface Temperature (SST) anomaly plot (Figure 3). The temperature in the surface layer from northern North Sea in the south to Barents Sea in the north, and from the Norwegian coast in the east to Greenland in the west was between 1-2°C warmer in July 2016 than the average for the last 20 years (Figure 3). In the central and eastern part of the Norwegian Sea the SST was also 1-2°C warmer than the 20 year average. The waters around Faroe Islands and Iceland also had 1-2°C warmer waters compared to July 2015. South of the Greenland-Scotland ridge the SST was about 1°C lower or at the same level compared to the 20 year average. The surface temperatures were warmer in July 2016 compared to July 2015 (Figure 4), although not as warm as found in July 2014.

It must be mentioned that the NOAA sea surface temperature measurements (SST) are sensitive to the weather condition (i.e. wind and cloudiness) prior to and during the observations and do therefore not necessarily reflect the oceanographic condition of the water masses in the areas, as seen when comparing detailed features of SSTs between years (Figures 3 and 4). However, since the anomaly is now based on averages values over whole July, it should give representative results of the surface temperature.

The upper layer (< 30 m depth) was 1-2°C warmer in 2016 compared to 2015 more or less throughout the surveyed area (Figures 5 and 6). The temperature in the upper layer was more than 6°C in more or less throughout the surveyed area covering approximately 3 million km², except along the north-western fringes of the surveyed area and north of Bear Island where it was slightly lower. In the deeper layers (50 m and deeper), the hydrographical features in the area were similar to 2014 and 2015. At all depths there was a clear signal from the cold East Icelandic Current, which originates from the East Greenland Current.

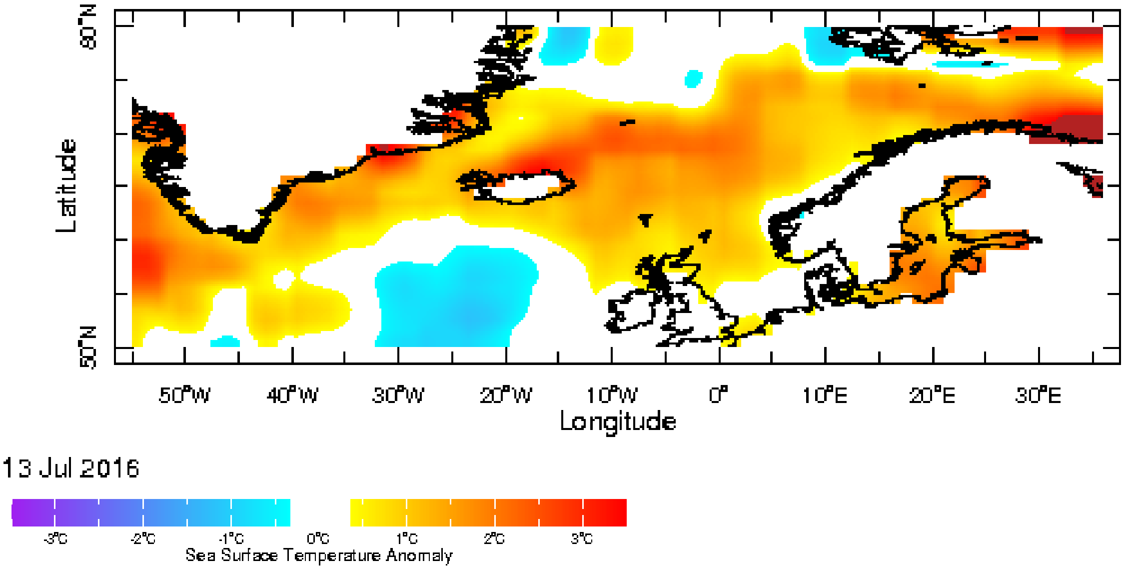


Figure 3. Sea surface temperature anomaly in July (°C; centered for mid July 2016) showing warm and cold conditions in comparison to a 20 year average.

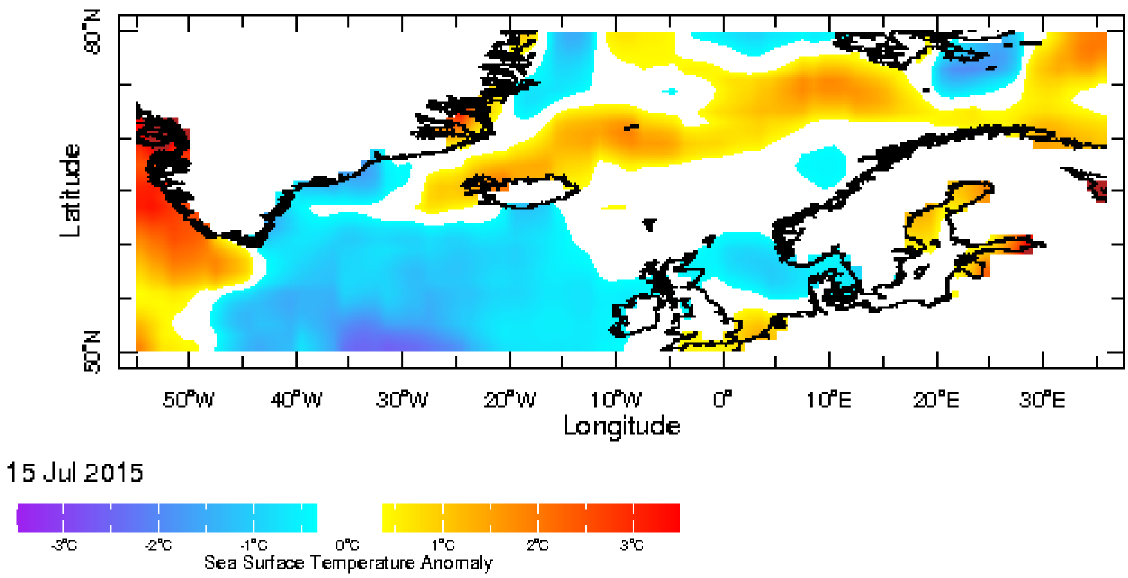


Figure 4. Sea surface temperature anomaly in July (°C; centered for mid July 2015) showing warm and cold conditions in comparison to a 20 year average.

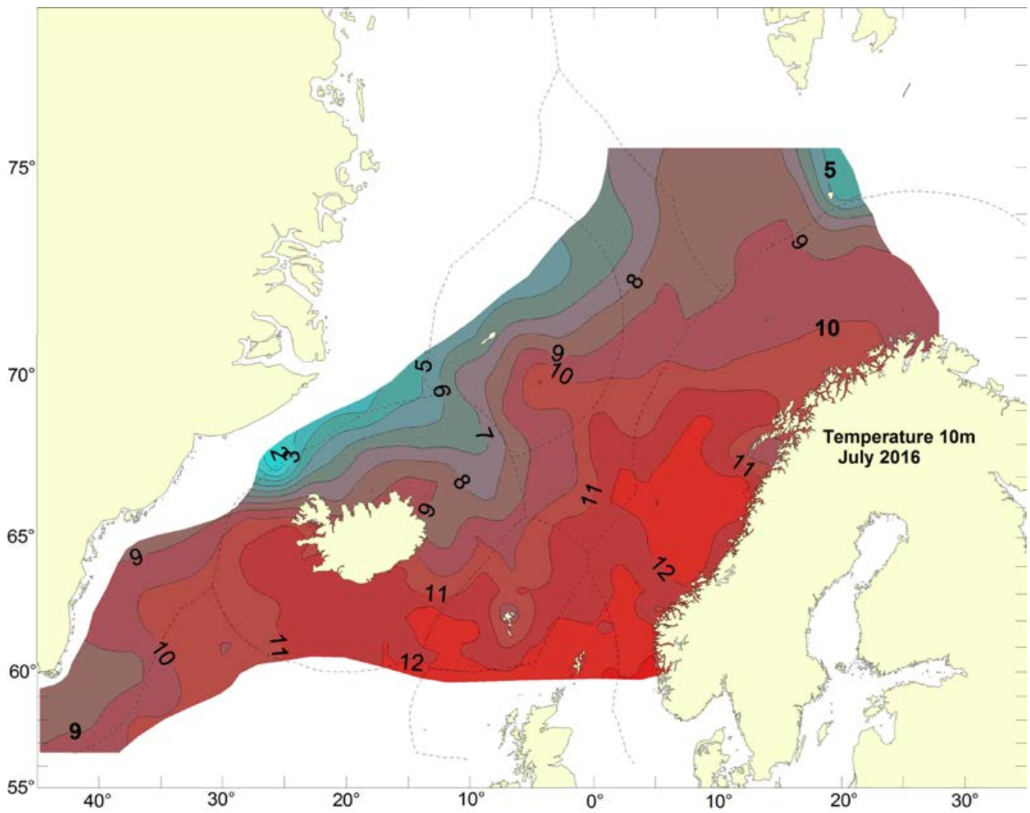


Figure 5. Temperature (°C) at 10 m depth in the Norwegian Sea and surrounding waters in July 2016.

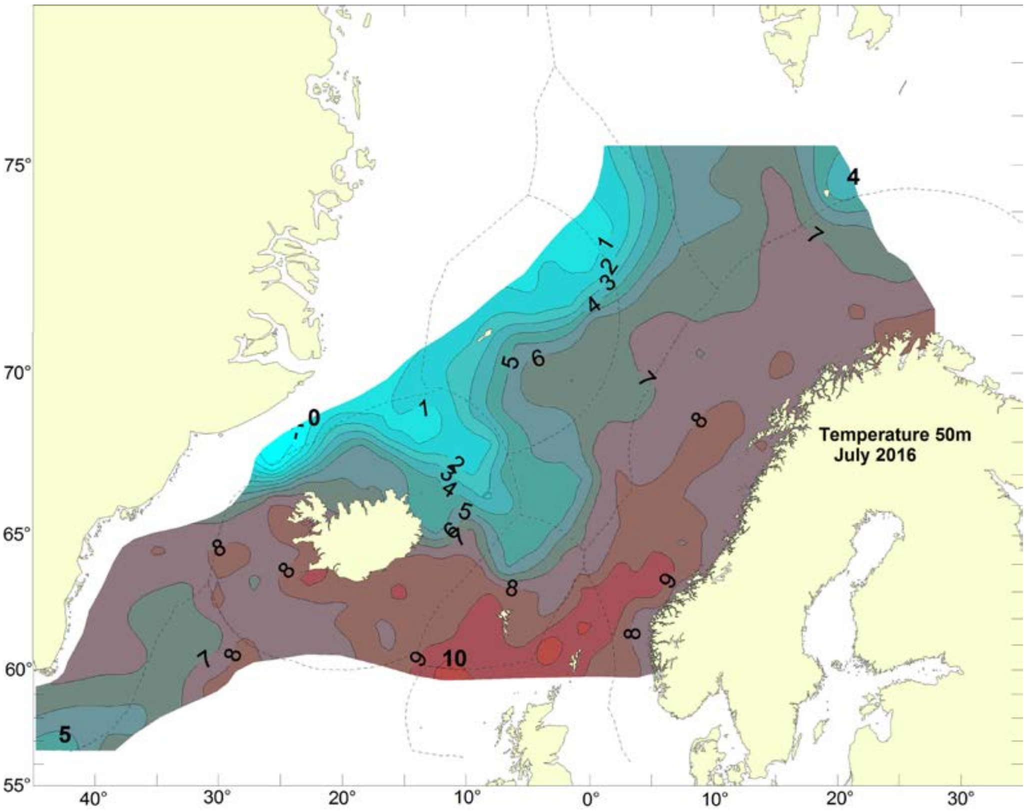


Figure 6. Temperature (°C) at 50 m depth in the Norwegian Sea and surrounding waters in July 2016.

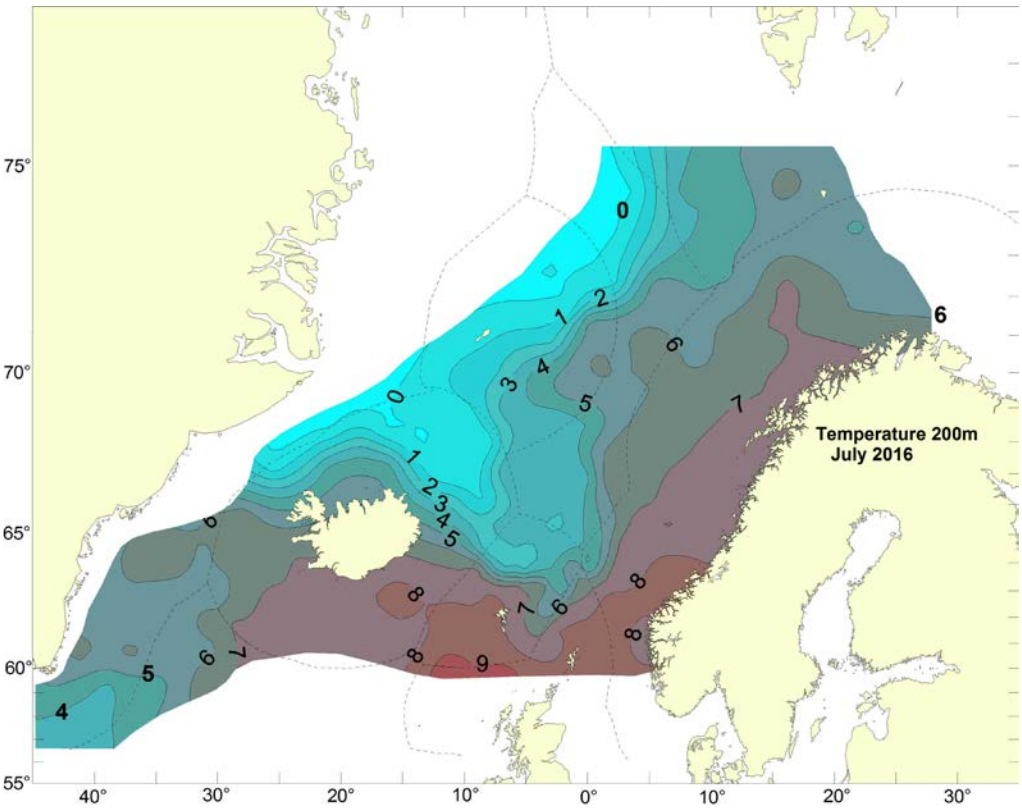


Figure 7. Temperature (°C) at 100 m depth in the Norwegian Sea and surrounding waters in July 2016.

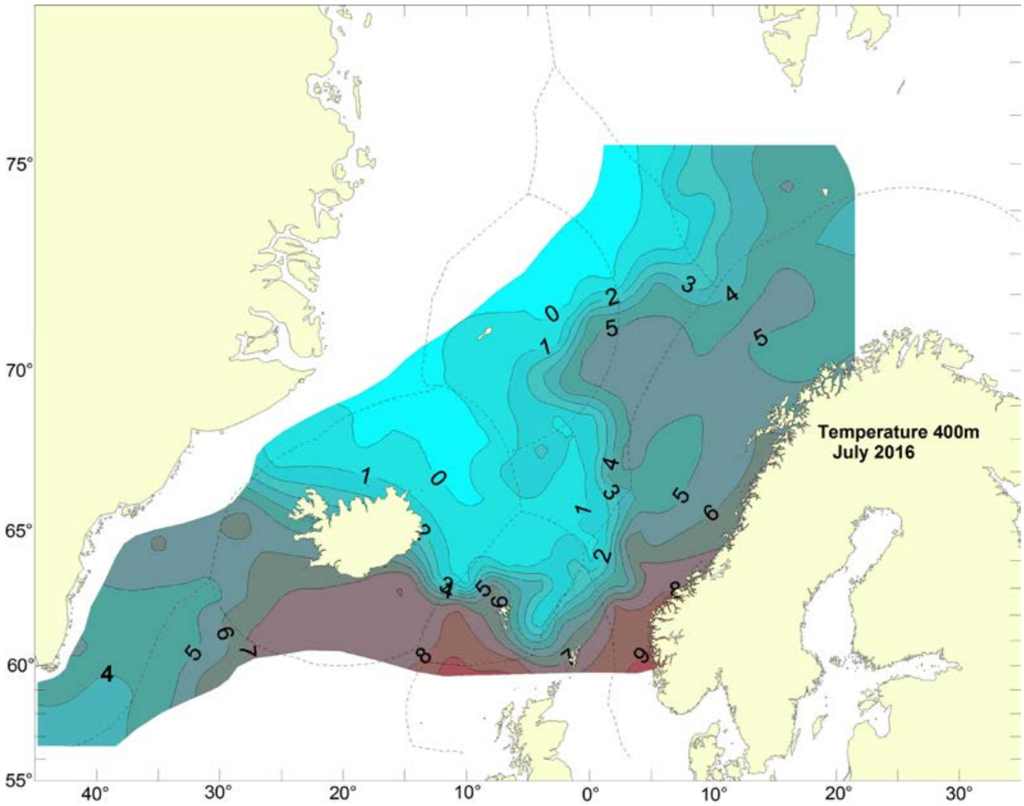
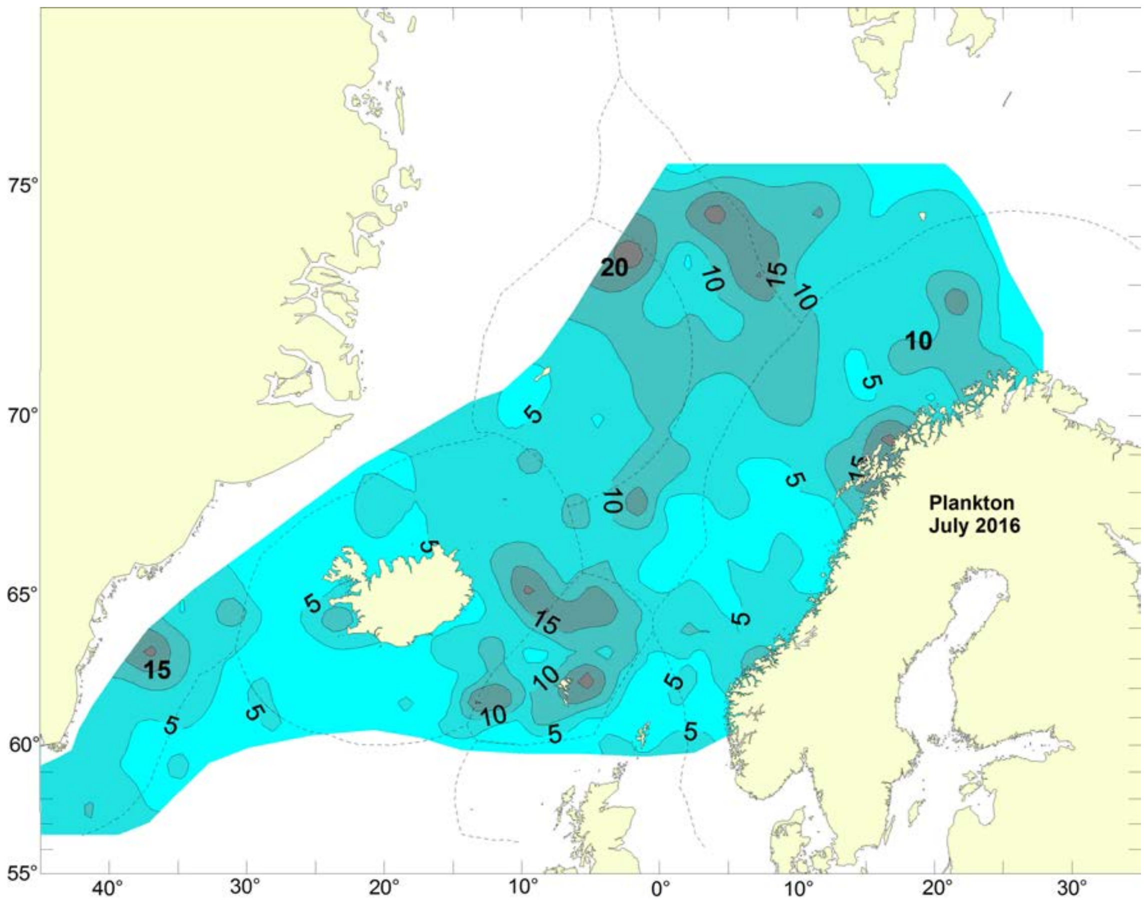


Figure 8. Temperature (°C) at 400 m depth in the Norwegian Sea and surrounding waters in July 2016

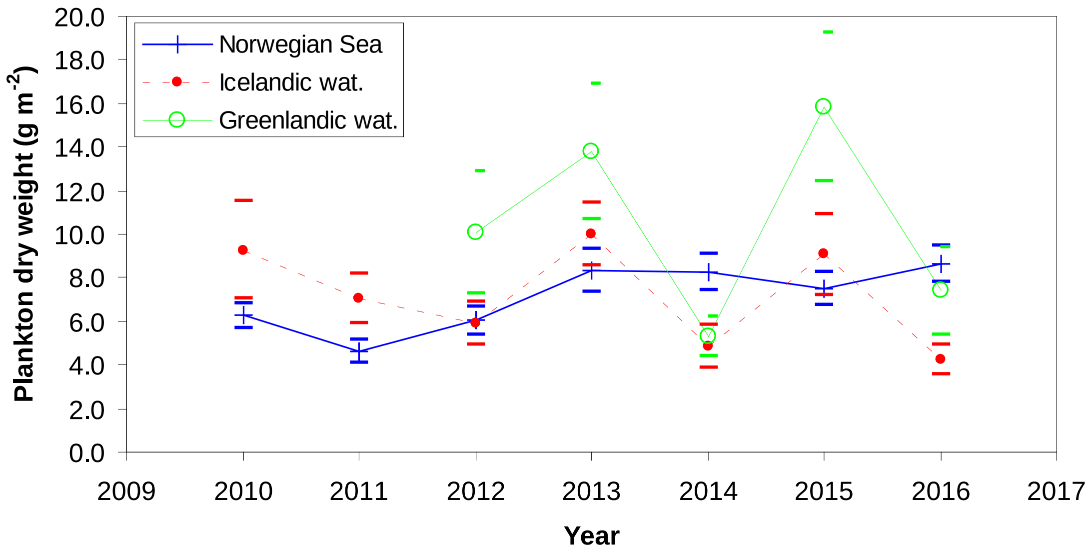
4.2 Zooplankton

The zooplankton biomass was relatively uniform over the whole survey area, with several areas with higher density, according to the dry weight measurements of the WP2 samples (Figure 9a). The average index for the Norwegian Sea was slightly higher in 2016 (8.6 g m^{-2}; n=158), than in 2015 while 50% lower in Icelandic waters (4.2 g m^{-2}; n=56) and Greenlandic waters (7.4 g m^{-2}; n=21) (Figure 9b). This relatively short time-series show more fluctuations and more variability in the Icelandic waters and Greenlandic waters than in the Norwegian Sea, which might in part be explained by both more homogeneous oceanographic condition in the area defined as Norwegian Sea and more sampling stations.

The zooplankton samples for species identification have not been examined in detail.



(a)



(b)

Figure 9. Zooplankton biomass indices (g dw/m^2, 0-200 m) (a) in the Norwegian Sea and surrounding waters in July 2016 and (b) time-series for three areas or Norwegian Sea (between 17°E and 14°W and north of 61°N), Icelandic waters (between 14°W and 30°W) and Greenlandic waters (west of 30°W).

4.3 Mackerel

The mackerel catch rates by trawl station (kg/km^2) measured with the Multpelt 832 is presented in Figure 10 together with the mean catch rates per 2*4° rectangles. The map is showing large variations in trawl catch rates throughout the survey area from zero to 15 206 kg corresponding to 50 527 kg/km^2. The mackerel occupied a very wide spatial distribution of 3.0 million km^2. High density areas were found in the central and north-western part of the Norwegian Sea as well as in southern and western part of Iceland and further west into Greenland waters and international waters south-east of Greenland.

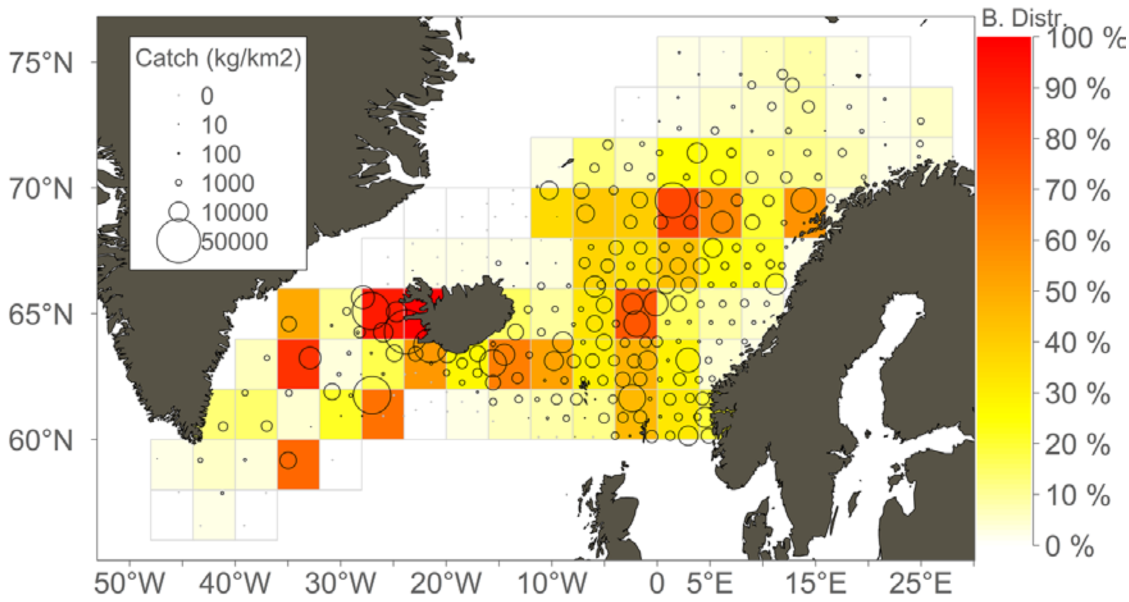


Figure 10. Mackerel catch rates by Multpelt 832 pelagic trawl haul (circle areas represent catch rates in kg/km^2) overlaid on mean catch rates per standardized rectangles (2° lat. x 4° lon.). White rectangles indicate zero-observations and yellow-red colour scale represent the biomass distribution (illustrated as cumulative fractions, e.g. the sum of all areas with the colour corresponding to 40% represents 40% of the total biomass in the entire survey).

The length distribution of NEA mackerel during the IESSNS survey showed a pronounced length-dependent distribution pattern both with regard to latitude and longitude. The largest mackerel on average were found in the northernmost (39 cm in length) (including northeast in the Barents Sea) and westernmost (40 cm in length) part of the covered area (Figure 11).

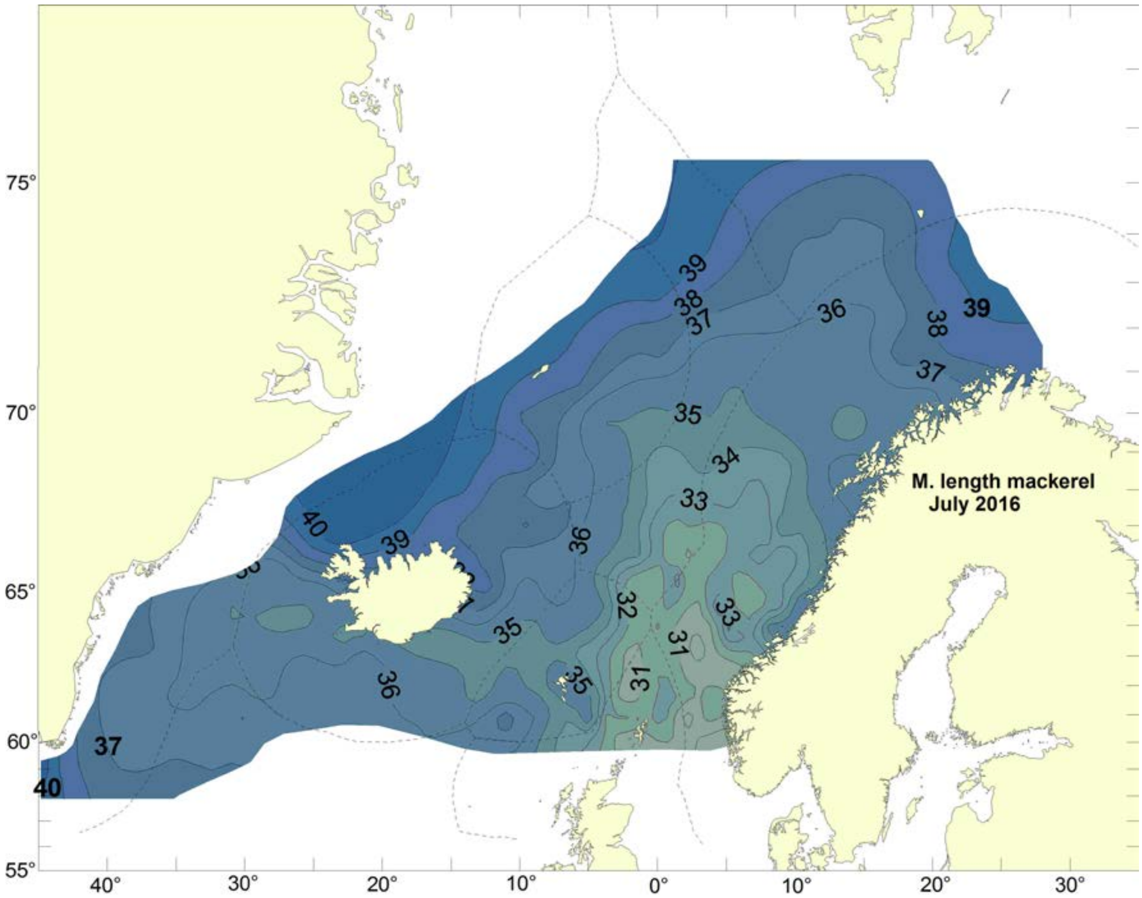


Figure 11. Average length distribution of NEA mackerel from the joint ecosystem survey with the five involved vessels M/V "M. Ytterstad", M/V "Vendla", M/V "Trøndur i Gøtu", R/V "Árni Friðriksson" and M/V "Finnur Fridi" in the Nordic Seas between 1st and 31st of July 2016.

Mackerel caught in the pelagic trawl hauls onboard the five vessels varied from 27 cm to 43 cm in length with the individuals between 28-30 cm, 33-38 cm dominating in the abundance. The mackerel weight (g) varied between 180 to 860 g). The 2014-year class (2 year olds) dominated among juvenile mackerel caught. The spatial distribution and overlap between the major pelagic fish species (mackerel, herring, blue whiting, salmon, lumpsucker) from the joint ecosystem IESSNS survey 2016 in the Nordic Seas according to the catches are shown in Figure 12.

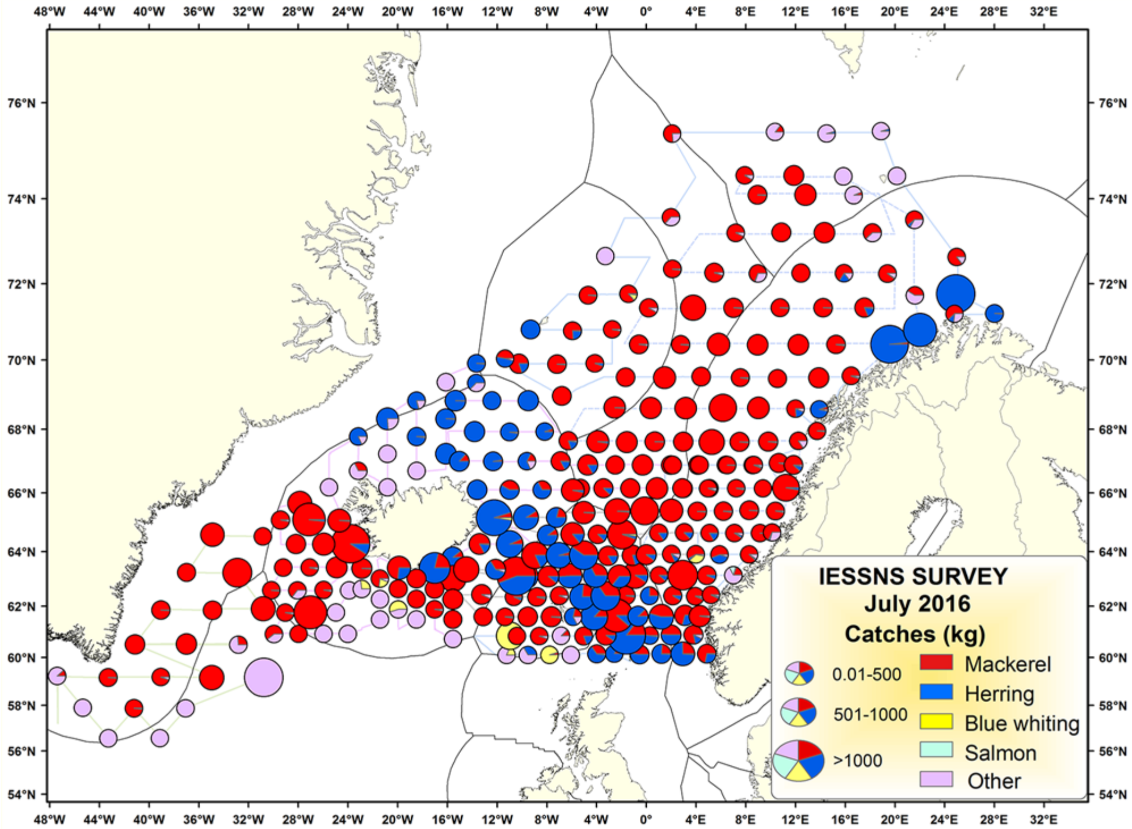


Figure 12. Distribution and spatial overlap between mackerel (red), herring (blue), blue whiting (yellow) and salmon (turquoise) from joint ecosystem surveys conducted onboard M/V "M. Ytterstad" and M/V "Vendla" (Norway), M/V "Trøndur i Gøru" (Faroe Islands), R/V "Árni Friðriksson" (Iceland) and M/V "Finnur Fridi" (chartered to Greenland) in the Norwegian Sea and surrounding waters between 1st to 31st of July 2016. Vessel tracks are shown as continuous lines.

Swept area analyses from standardized pelagic trawling with Multpelt 832

The swept area estimates of mackerel biomass in July 2016 were based on average density of mackerel within rectangles of 2° latitude and 4° longitude. Mackerel were horizontally distributed over more or less the entire survey area. Compared to last year, there are less mackerel in the eastern region while there are more in the west. The total biomass estimate was 10.23 million tonnes, which is a 33% increase from last year. This is the highest index in the time series, nearly 14 % higher than the previous maximum, which was in 2014. The allocation to different EEZs is given in Annex 1. The total area of rectangles with mackerel is 3.0 million km^2.

The total survey index for number-at-age is 27 billion individuals. The dominating age groups are 2, 5 and 6 year olds, which are the 2014, 2011 and 2010 year classes (Figure 13) and they contributed to 55% of the total biomass estimate.

The indices used for NEA mackerel stock assessment in WGIWIDE are the number-at-age indices for age 6 to 10 year (Table 7) divided by the spatial distribution of these ages which was 2.34 mill. km^2.

The internal consistency plot for age-disaggregated year classes (Fig. 20) has improved since the benchmark in 2014 by the inclusion of three more survey years (2014, 2015 and 2016). This is especially apparent for younger ages (1-5 years), where the year-to-year correlation is now between 0.80 and 0.97, somewhat higher than the 5-10 years old mackerel (0.47 to 0.73). The internal consistency of the oldest mackerel (10+) is poor, ranging from -0.22 to 0.85 which likely reflects the difficulties in aging old mackerel and their relatively low number in the catches.

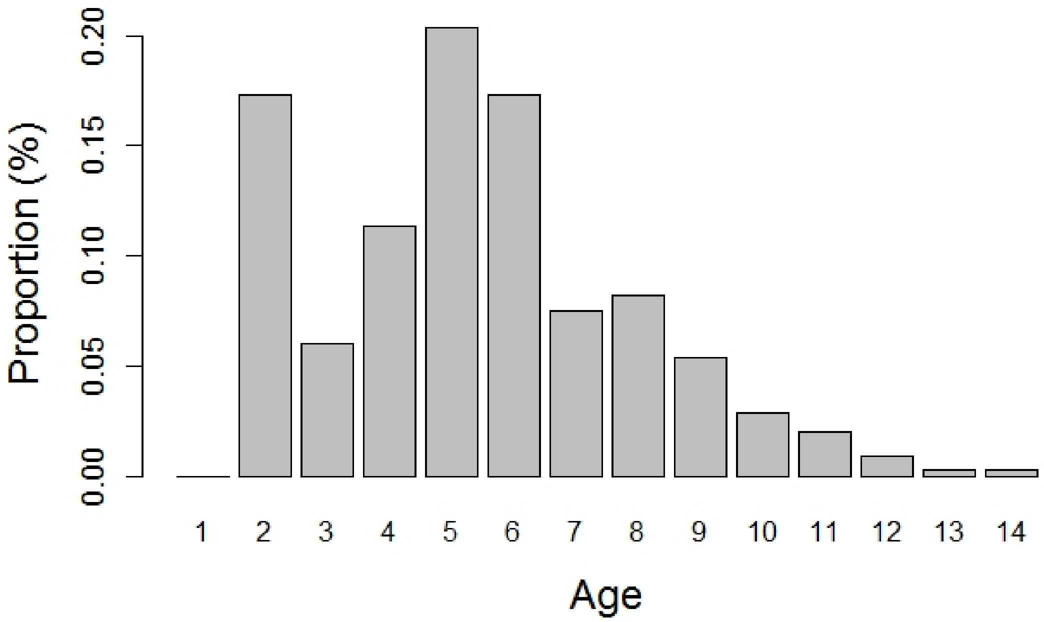


Figure 13. Age distribution in proportion (0.00-1.00) of Northeast Atlantic mackerel in the IESSNS 2016.

Table 7. Time series of the IESSNS showing (a) age-disaggregated abundance indices of mackerel (billions), (b) mean weight (g) per age and (c) estimated biomass at age (million tonnes).

a)														
Year\Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14(+)	Tot N
2007	1.33	1.86	0.90	0.24	1.00	0.16	0.06	0.04	0.03	0.01	0.01	0.00	0.01	0.00	5.65
2010	0.03	2.80	1.52	4.02	3.06	1.35	0.53	0.39	0.20	0.05	0.03	0.02	0.01	0.01	13.99
2011	0.21	0.26	0.87	1.11	1.64	1.22	0.57	0.28	0.12	0.07	0.06	0.02	0.01	0.00	6.42
2012	0.50	4.99	1.22	2.11	1.82	2.42	1.64	0.65	0.34	0.12	0.07	0.02	0.01	0.01	15.91
2013	0.06	7.78	8.99	2.14	2.91	2.87	2.68	1.27	0.45	0.19	0.16	0.04	0.01	0.02	29.57
2014	0.01	0.58	7.80	5.14	2.61	2.62	2.67	1.69	0.74	0.36	0.09	0.05	0.02	0.00	24.37
2015	1.20	0.83	2.41	5.77	4.56	1.94	1.83	1.04	0.62	0.32	0.08	0.07	0.04	0.02	20.72
2016	0.01	4.68	1.63	3.06	5.50	4.67	2.04	2.23	1.47	0.77	0.56	0.26	0.09	0.09	27.06
b)															
Year\Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14(+)	W
2007	133	233	323	390	472	532	536	585	591	640	727	656	685	671	512
2010	133	212	290	353	388	438	512	527	548	580	645	683	665	596	469
2011	133	278	318	371	412	440	502	537	564	541	570	632	622	612	467
2012	112	188	286	347	397	414	437	458	488	523	514	615	509	677	426
2013	96	184	259	326	374	399	428	445	486	523	499	547	677	607	418
2014	228	275	288	335	402	433	459	477	488	533	603	544	537	569	441
2015	128	290	333	342	386	449	463	479	488	505	559	568	583	466	431
2016	92	235	328	361	371	399	445	463	479	495	501	503	533	546	411

c)

Year\Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14(+)	Tot B
2007	0.18	0.43	0.29	0.09	0.47	0.09	0.03	0.02	0.02	0.01	0.01	0.00	0.01	0.00	1.64
2010	0.00	0.59	0.44	1.42	1.19	0.59	0.27	0.20	0.11	0.03	0.02	0.01	0.01	0.00	4.89
2011	0.03	0.07	0.28	0.41	0.67	0.54	0.29	0.15	0.07	0.04	0.03	0.01	0.01	0.00	2.69
2012	0.06	0.94	0.35	0.73	0.72	1.00	0.72	0.30	0.17	0.06	0.03	0.01	0.00	0.00	5.09
2013	0.01	1.43	2.32	0.70	1.09	1.15	1.15	0.56	0.22	0.10	0.08	0.02	0.01	0.01	8.85
2014	0.00	0.16	2.24	1.72	1.05	1.14	1.23	0.80	0.36	0.19	0.05	0.03	0.01	0.00	8.98
2015	0.15	0.24	0.80	1.97	1.76	0.87	0.85	0.50	0.30	0.16	0.04	0.04	0.02	0.01	7.72
2016	0	1.11	0.54	1.11	2.07	1.87	0.91	1.03	0.7	0.39	0.28	0.13	0.05	0.05	10.24

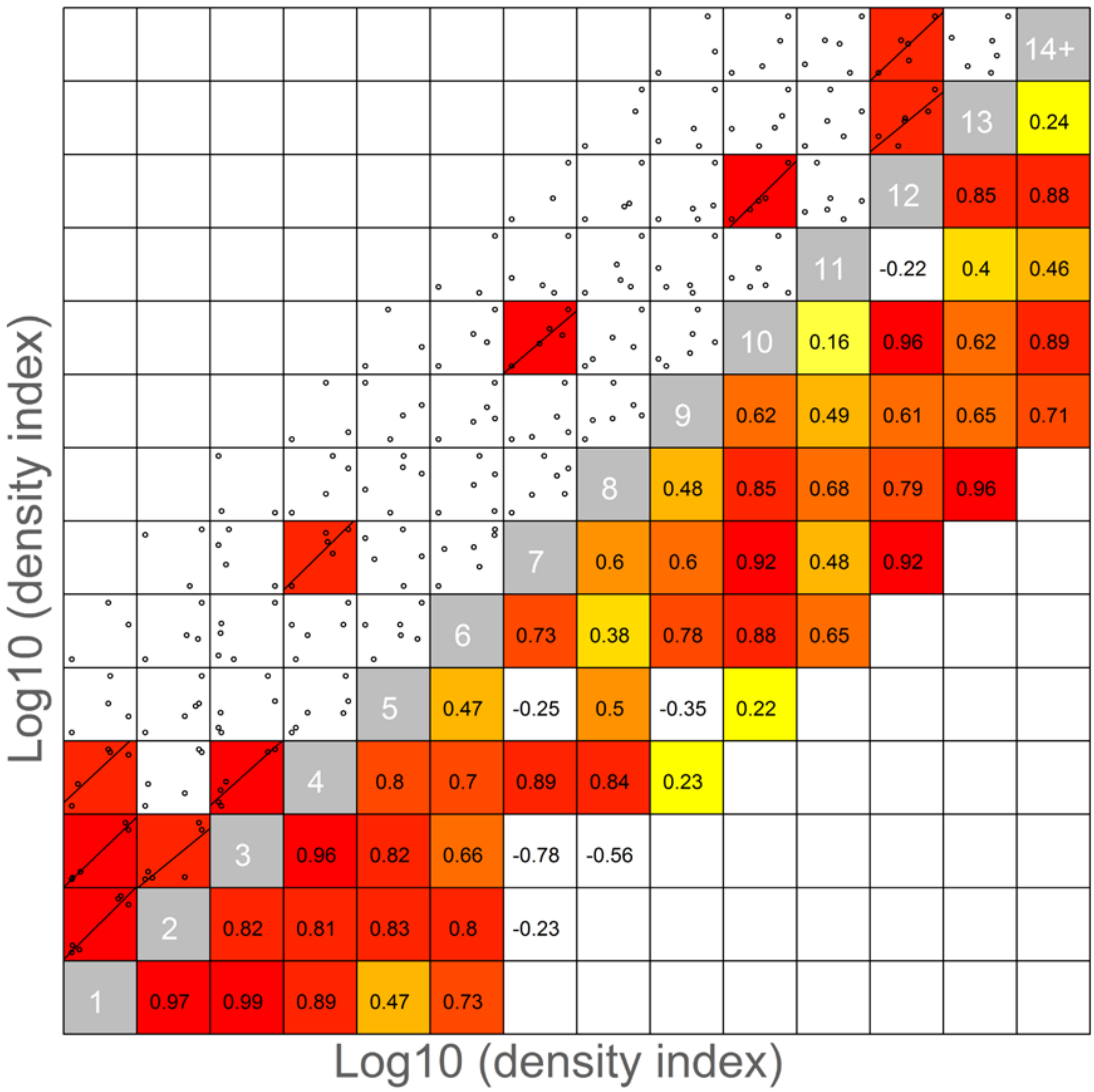


Figure 14. Internal consistency of mackerel density index. Ages indicated by white numbers in grey diagonal cells. Statistically significant positive correlations (*p<0.05*) are indicated by regression lines and red cells in upper left half. Correlation coefficients (r) are given in the lower right half.

Multibeam sonar recordings

Multibeam sonar recordings were conducted and recorded onboard the two Norwegian vessels M. Ytterstad and Vendla. The mackerel schools detected were of small size predominantly with low density and appearing more as individual fish or loose aggregations. They were detected swimming in the upper 5-30 m of the water column throughout the day. However, within large proportions of the mackerel distribution areas based on the Multpelt trawling we could only detect any mackerel on the multibeam sonars (Simrad SH90 and Simrad SX90) when the mackerel were swimming in more concentrated shoals and aggregations. Even if we maximized the ping rate on both the multibeam sonars and multi-frequency echosounders including an array of frequencies from 18 to 333 kHz, the mackerel were practically invisible for the multibeam sonars as well as for the multifrequency echosounders. The main reason is probably due to very loose aggregations/shoals close to the surface thereby providing extremely low detection probability on any acoustic instrumentation including multi-frequency echosounder and high and low frequency multibeam sonars. We could sometimes detect nothing or very little on the sonars but still got medium to high catches of mackerel during surface trawling with the Multpelt 832 pelagic sampling trawl, also suggesting very dispersed mackerel concentrations.

4.4 Norwegian spring-spawning herring

Norwegian spring-spawning herring (NSSH) was recorded mainly in the southern and western part of the Norwegian Sea basin and east and north of Iceland (Figure 15). Herring registrations south of 62°N in the eastern part were allocated to a different stock, North Sea herring. Also herring to the west in Icelandic waters (west of 14°W south of Iceland and west of 24°W north of Iceland) were allocated to a different stock, Icelandic summer-spawners. The abundance of NSSH in the eastern and northeastern part of the area surveyed were lower and consisted mainly of younger and smaller fish than in the western part. The 0-boundary of the distribution of the adult part of NSS herring was considered to be reached in all directions.

The NSS herring stock is dominated by 12 year old herring (year classes 2004) in terms of numbers and biomass (Table 8). This year class contribute 23% to the total biomass in the Norwegian Sea. The total number of herring recorded in the Norwegian Sea was 20.2 billion in 2016 and the total biomass was 6.75 million tonnes. Number by age, with uncertainty estimates, for NSS herring during IESSNS in July 2016 is shown in Figure 16.

Table 8. IESSNS 2016 in the Norwegian Sea. Estimates of abundance, mean weight and mean length of Norwegian Spring Spawning herring based on calculation in StoX.

Variable: Abundance
EstLayer: 1
Stratum: TOTAL (Excluded: 5,6)
SpecCat: SILDG03

LenGrp	age Unknown	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Number (1E3)	Biomass (1E3kg)	Mean W (g)
2-3	2388	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2388	-	-
8-9	2585	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2585	-	-
9-10	21165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21165	117.9	5.57
10-11	46841	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46841	338.7	7.23
11-12	10617	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10617	94.0	8.86
12-13	-	3053	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3053	42.7	14.00
13-14	-	18320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18320	338.9	18.50
14-15	-	16030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16030	327.5	20.43
17-18	779	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	779	28.8	37.00
19-20	-	1559	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1559	81.8	52.50
22-23	-	639	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	639	67.1	105.00
23-24	-	-	2109	412	-	-	-	-	-	-	-	-	-	-	-	-	-	2520	299.4	118.79
24-25	-	-	9170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9170	1220.8	133.13
25-26	-	-	16949	62924	3269	-	-	-	-	-	-	-	-	-	-	-	-	83142	12543.7	150.87
26-27	-	-	20014	178739	26016	4796	-	-	-	-	-	-	-	-	-	-	-	229565	39097.4	170.31
27-28	-	-	16134	178367	105622	20662	62841	-	508	1524	-	-	-	-	-	-	-	385657	73713.4	191.14
28-29	-	-	26340	81339	220922	31833	30534	79120	19652	5700	3103	9308	-	-	518	-	-	508369	111168.8	218.68
29-30	-	-	47260	29857	133473	237901	225109	65419	65334	53947	99046	7673	7673	2792	-	1861	-	977345	236844.8	242.33
30-31	-	-	-	86678	73796	323498	119490	184577	384811	91788	94253	14543	4529	2013	1510	503	5183	1387172	367701.8	265.07
31-32	-	-	-	68365	36453	211536	189073	150544	171712	56760	46344	28903	42806	-	5183	2741	20431	1030850	294710.2	285.89
32-33	-	-	-	72213	29892	267117	112390	93312	77074	51577	68961	51941	-	2089	16226	-	-	842790	257427.7	305.45
33-34	-	-	-	-	17315	296541	250871	325246	112499	17213	32533	15514	46541	-	3878	-	-	1118149	359389.0	321.41
34-35	-	-	-	-	-	188375	299084	609293	229896	163557	266406	241283	320515	35420	32667	1068	-	2387563	823701.8	345.00
35-36	-	-	-	-	-	36909	291651	343894	299559	484086	656047	582945	1664536	322945	22723	28966	7206	4741467	1698922.5	358.31
36-37	-	-	-	-	-	-	57911	137195	122739	269389	538210	799644	1378143	592708	115958	31091	13706	4056693	1511822.2	372.67
37-38	-	-	-	-	-	10512	-	-	42548	68310	118625	400705	578343	312987	143429	92698	46370	1814526	715680.6	394.42
38-39	-	-	-	-	-	-	-	-	-	-	30950	34253	133140	122819	135482	21242	-	477887	200560.2	419.68
39-40	-	-	-	-	-	-	-	-	-	-	-	-	14287	66442	-	6123	-	86852	37657.6	433.58
40-41	-	-	-	-	-	-	-	-	-	-	-	-	5170	-	10724	-	-	15894	7589.5	477.50
41-42	5170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5170	-	-
TSN(1000)	89547	39602	137975	758893	646757	1629678	1638955	1988599	1526332	1263851	1954476	2186711	4195684	1460213	488298	186294	92895	20284760	-	-
TSB(1000 kg)	579.5	858.1	25424.6	155698.2	148608.5	454539.7	503232.9	640454.1	490911.1	431627.6	685789.0	798891.7	1559906.7	557877.3	191479.3	72040.5	33570.0	-	6751488.9	-
Mean length (cm)	11.62	13.96	27.32	28.13	28.85	31.53	32.41	33.19	32.82	34.31	34.64	35.50	35.64	36.27	36.57	36.54	35.13	-	-	-
Mean weight (g)	7.30	21.67	184.27	205.16	229.77	278.91	307.05	322.06	321.63	341.52	350.88	365.34	371.79	382.05	392.14	386.70	361.37	-	-	333.00

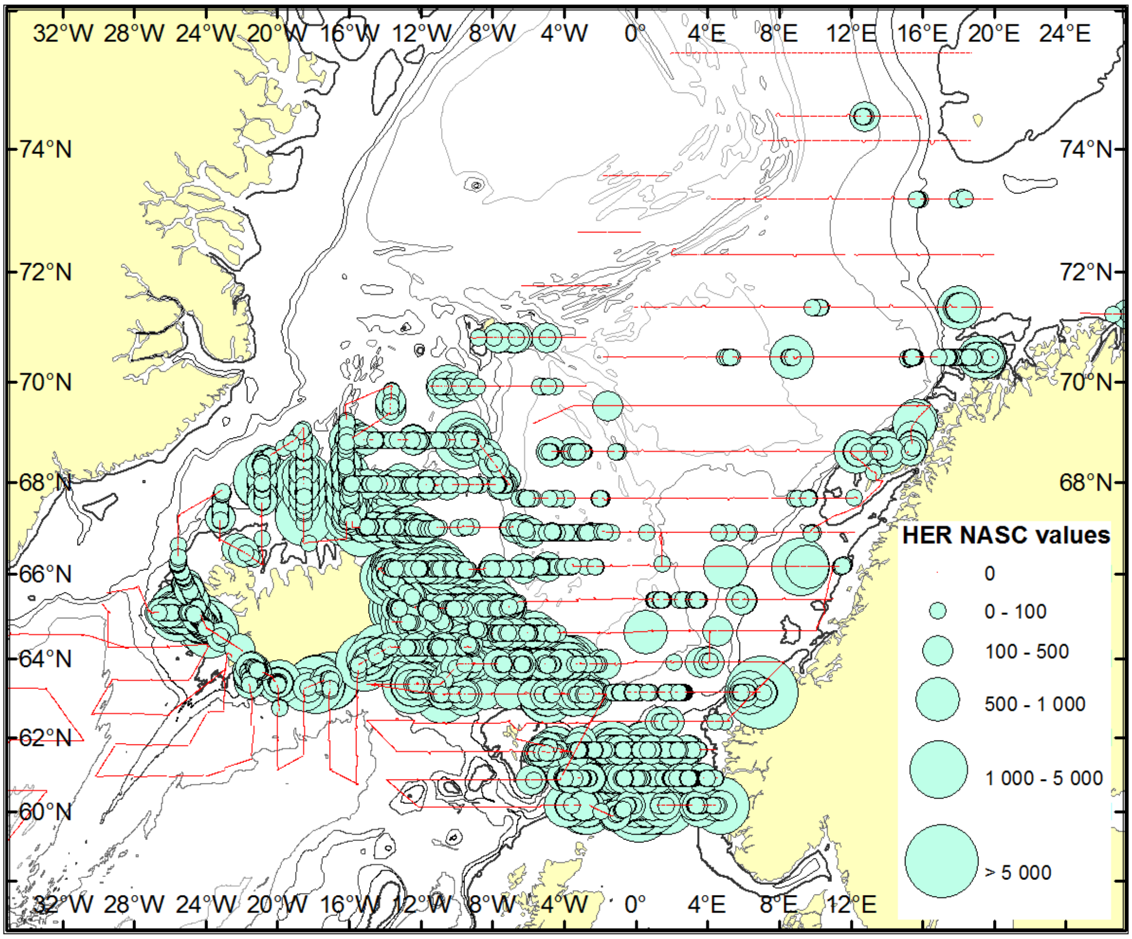


Figure 15. The sA/Nautical Area Scattering Coefficient (NASC) values of Norwegian spring-spawning herring, North Sea herring (north of 62°N) and Icelandic summer-spawning herring (west of 14°W south of Iceland and west of 25°W north of Iceland) along the cruise tracks in IESSNS in July 2016.

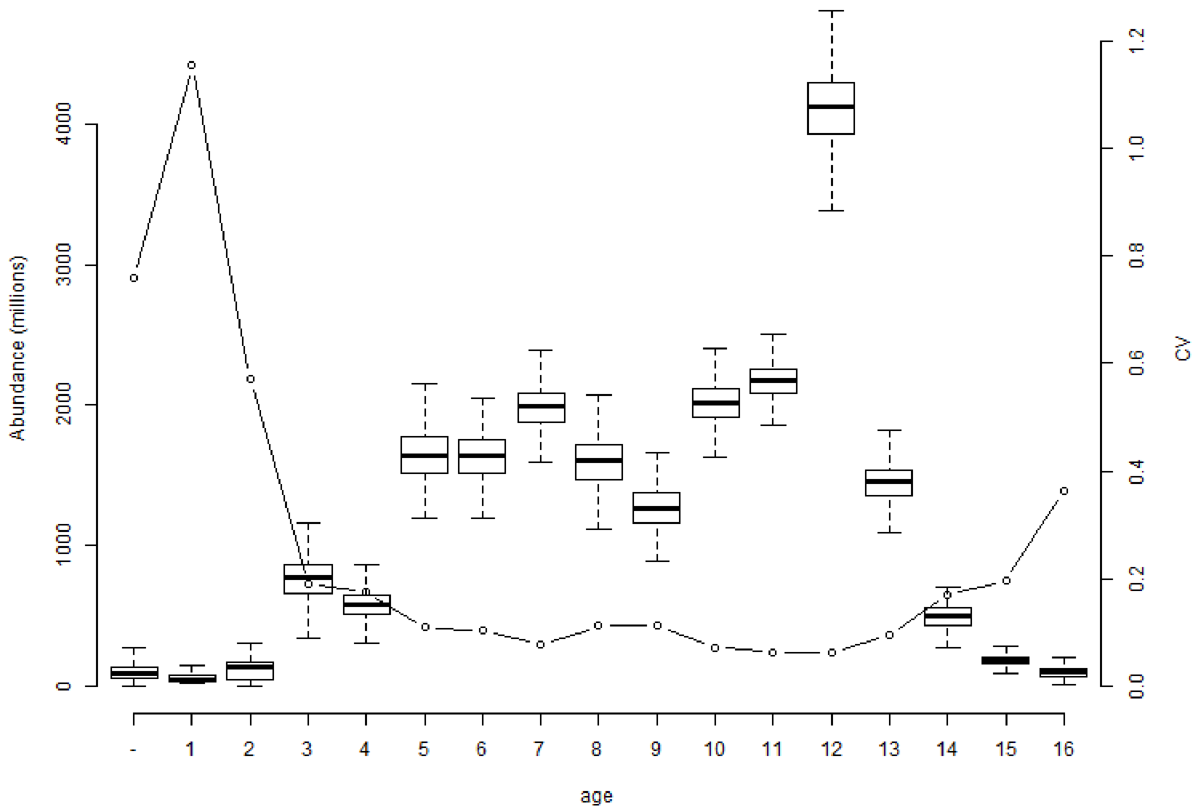


Figure 16. Number by age for NSS herring during IESSNS in July 2016. R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 500 replicates using the StoX software.

4.5 Blue whiting

The blue whiting was distributed in the entire survey area with exception of the far western and northwestern part. The highest sA-values were observed in the eastern and southern part of the Norwegian Sea, along the Norwegian continental slope, around the Faroe Islands as well as south of Iceland. The main concentrations were observed both in connections with the continental slopes in the eastern and the southern part of the Norwegian Sea (Figure 17). The largest fish were found in the central and northern part of the survey area.

The total biomass of blue whiting registered during the IESSNS survey in 2016 was 2.3 million tons (Table 9), which is approximately 0.8 million tonnes higher than what was observed in the IESNS in May. The stock estimate in number for 2016 is 30 billion. Age two is dominating the estimate (41% of the biomass and 38% by number). Number by age, with uncertainty estimates, for blue whiting during IESSNS in July 2016 is shown in Figure 18.

Table 9. IESSNS 2016 in the Norwegian Sea. Estimates of abundance, mean weight and mean length of blue whiting based on calculation in StoX.

Variable: Abundance
EstLayer: 1
Stratum: TOTAL
SpecCat: KOLMULE

LenGrp	age 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	Number (1E3)	Biomass (1E3kg)	Mean W (g)
10-11	64138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64138	534.5	8.33
11-12	1334076	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1334076	11969.1	8.97
12-13	1398214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1398214	15274.2	10.92
13-14	769659	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	769659	10621.3	13.80
14-15	215854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	215854	3810.1	17.65
15-16	25655	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25655	487.5	19.00
16-17	61259	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61259	1464.3	23.90
18-19	-	63234	53900	-	-	-	-	-	-	-	-	-	-	-	-	-	117134	4465.6	38.12
19-20	-	349126	17967	-	-	-	-	-	-	-	-	-	-	-	-	-	367093	13181.5	35.91
20-21	-	1091958	73642	-	-	-	-	-	-	-	-	-	-	-	-	-	1165600	57525.9	49.35
21-22	-	1788335	359802	8983	-	-	-	-	-	-	-	-	-	-	-	-	2157121	127255.6	58.99
22-23	-	1726223	1216251	672338	95232	-	-	-	-	-	-	-	-	-	-	-	3710044	248946.6	67.10
23-24	-	539807	3521303	969622	437473	-	-	-	-	-	-	-	-	-	-	-	5468205	412198.1	75.38
24-25	-	35672	2798864	654107	619098	188638	-	-	-	-	-	-	-	-	-	-	4296379	358098.7	83.35
25-26	-	14461	2122408	517209	508981	230729	16838	-	-	-	-	-	-	-	-	-	3410625	311701.6	91.39
26-27	-	1278	740044	386214	277258	69133	64124	24499	-	-	-	-	-	-	-	-	1562549	161589.3	103.41
27-28	-	-	235055	492958	248898	203973	54319	43829	-	-	-	-	-	-	-	-	1279032	149990.0	117.27
28-29	-	-	212989	317873	120071	184572	60231	42162	-	-	-	-	-	-	-	-	937897	120103.0	128.06
29-30	-	-	20027	133832	119789	40644	14399	-	57595	-	-	-	-	-	-	-	386284	52655.9	136.31
30-31	-	-	-	98694	82136	63617	55385	-	-	-	-	-	-	-	-	-	299832	46015.3	153.47
31-32	-	-	-	40297	18656	41636	5726	10021	-	-	22748	-	-	-	-	-	139084	21627.7	155.50
32-33	-	-	-	2786	41142	56124	9117	-	48037	-	16011	-	-	-	-	-	173217	33230.1	191.84
33-34	-	-	-	-	9726	38045	-	8589	-	-	47986	-	14189	-	-	-	118536	23253.9	196.18
34-35	-	-	-	-	10021	-	31500	2863	-	8008	-	15750	-	-	-	2863	71006	14628.0	206.01
35-36	-	-	-	-	-	-	6288	37800	-	-	-	18900	2863	49427	-	-	115279	30494.0	264.52
36-37	-	-	-	-	-	-	4843	-	18900	-	-	-	-	18900	5726	-	48369	12870.6	266.09
37-38	-	-	-	-	-	-	-	17969	34506	-	17969	-	-	-	-	-	70445	18704.4	265.52
38-39	-	-	-	-	-	-	-	-	4843	-	-	-	-	-	-	-	4843	1375.4	284.00
39-40	-	-	-	-	-	21057	-	21057	-	-	-	-	-	-	-	-	42113	15266.0	362.50
41-42	-	-	-	-	-	-	-	-	12828	-	-	-	-	-	-	-	12828	3668.7	286.00
TSN(1000)	3868857	5610095	11372252	4294911	2588479	1138166	322770	208789	176709	8008	104714	34650	17052	68327	5726	2863	29822369	-	-
TSB(1000 kg)	44160.8	327458.7	933640.3	410073.8	257167.2	140314.9	41598.0	39360.9	34818.7	1145.2	20071.0	8390.0	3824.9	18763.4	1514.6	704.3	-	2283006.7	-
Mean length (cm)	12.27	21.44	24.00	24.97	25.53	27.45	28.91	31.30	33.45	34.25	33.26	34.55	33.60	35.30	36.38	34.50	-	-	-
Mean weight (g)	11.41	58.37	82.10	95.48	99.35	123.28	128.88	188.52	197.04	143.00	191.67	242.14	224.31	274.61	264.50	246.00	-	-	76.55

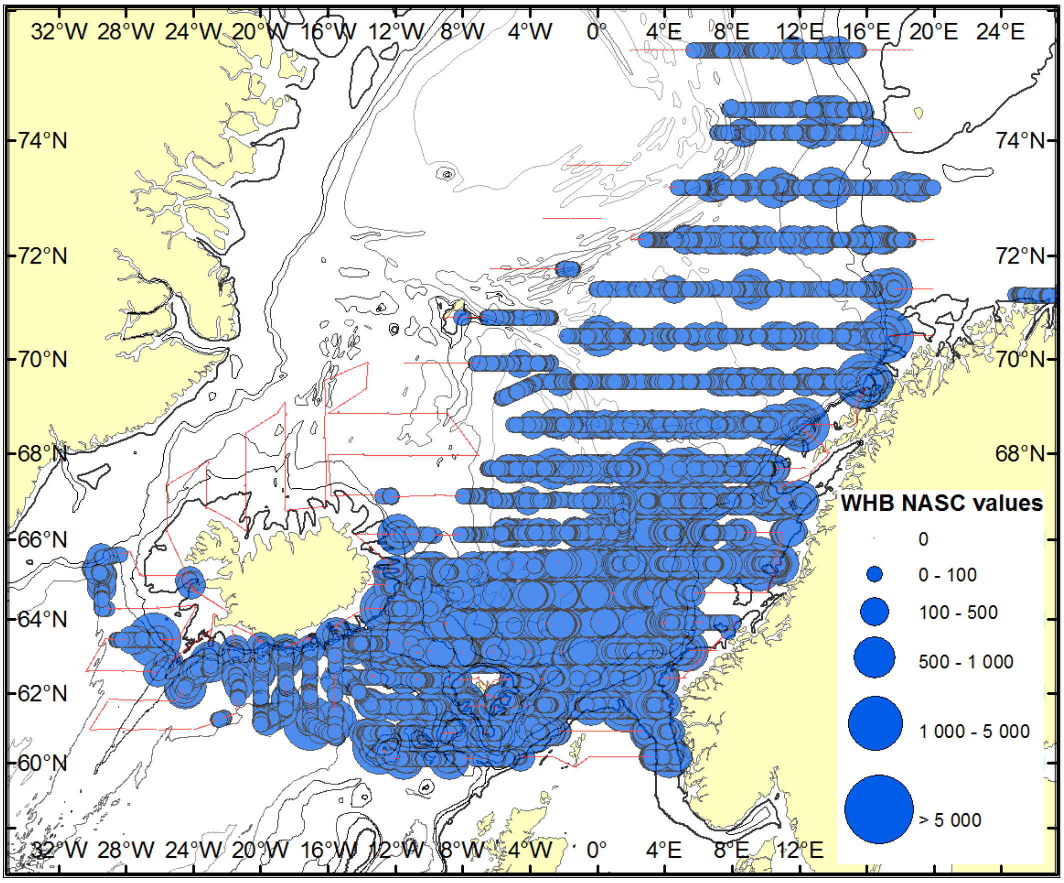


Figure 17. The sA/Nautical Area Scattering Coefficient (NASC) values of blue whiting along the cruise tracks in IESSNS in July 2016.

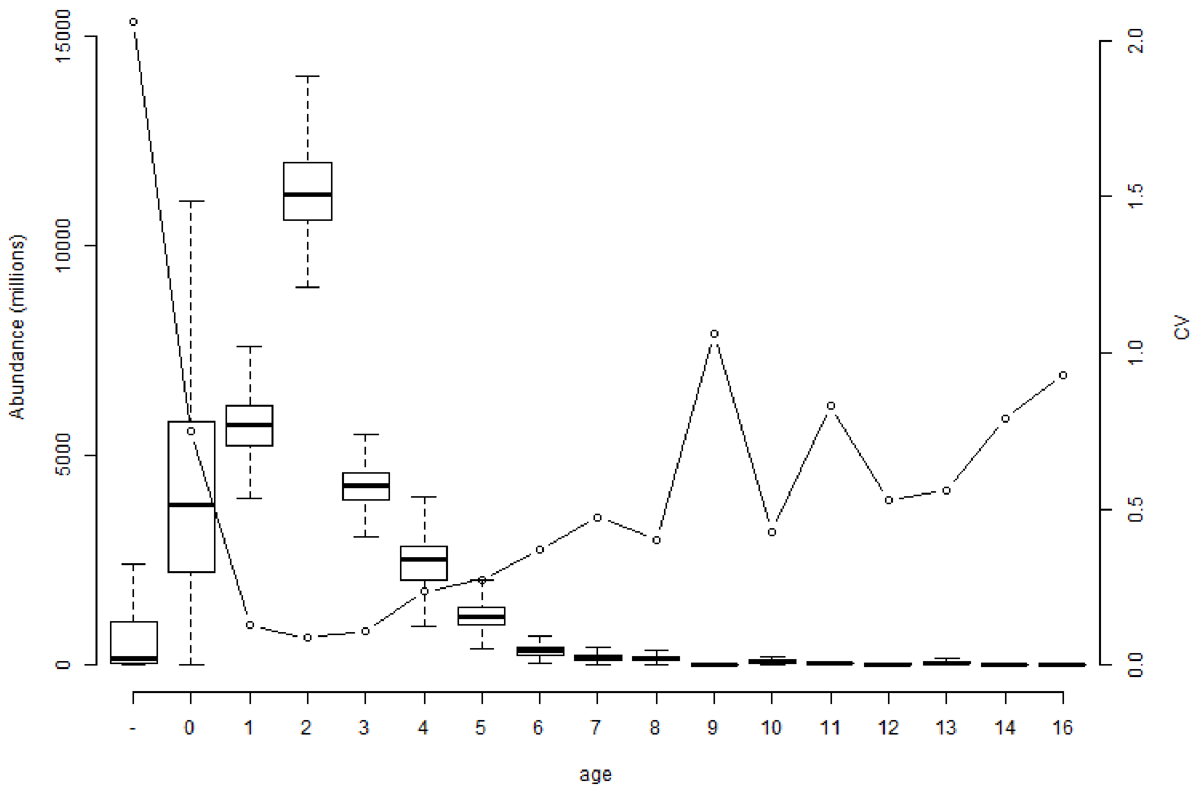


Figure 18. Number by age with uncertainty for blue whiting during IESSNS in July 2016. R boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 500 replicates using the StoX software.

4.6 Other species

Lumpfish (*Cyclopterus lumpus*)

Lumpfish was caught in approximately 80% of trawl stations in July 2016 onboard the five vessels (Figure 24). There was occurrence of lumpfish all the way from west of Cape Farwell in Greenland in the southwest to the central Barents Sea in the northeast part of the covered area. Lumpfish was present at majority of stations north of 66°N, whereas lumpfish was scarcer south of 65°N south of Iceland, in Faroese waters and northern UK waters. Of note, total trawl catch at each trawl station were processed on board Árni Friðriksson, M. Ytterstad, Vendla and Finnur Fríði, whereas a subsample of 100 kg to 200 kg was processed onboard Trøndur i Gøtu in Faroese waters. Therefore, small catches (< 10 kg) of lumpfish might be missing from the survey track of Trøndur i Gøtu (black crosses). However, it is unlikely that larger catches of lumpfish would have gone unnoticed by crew during sub-sampling of catch on Trøndur i Gøtu. Generally, the mean length and mean weight of the lumpfish was highest in the coastal waters and along the shelf edges in southwest, west, and northwest, and lowest in the central Norwegian Sea.

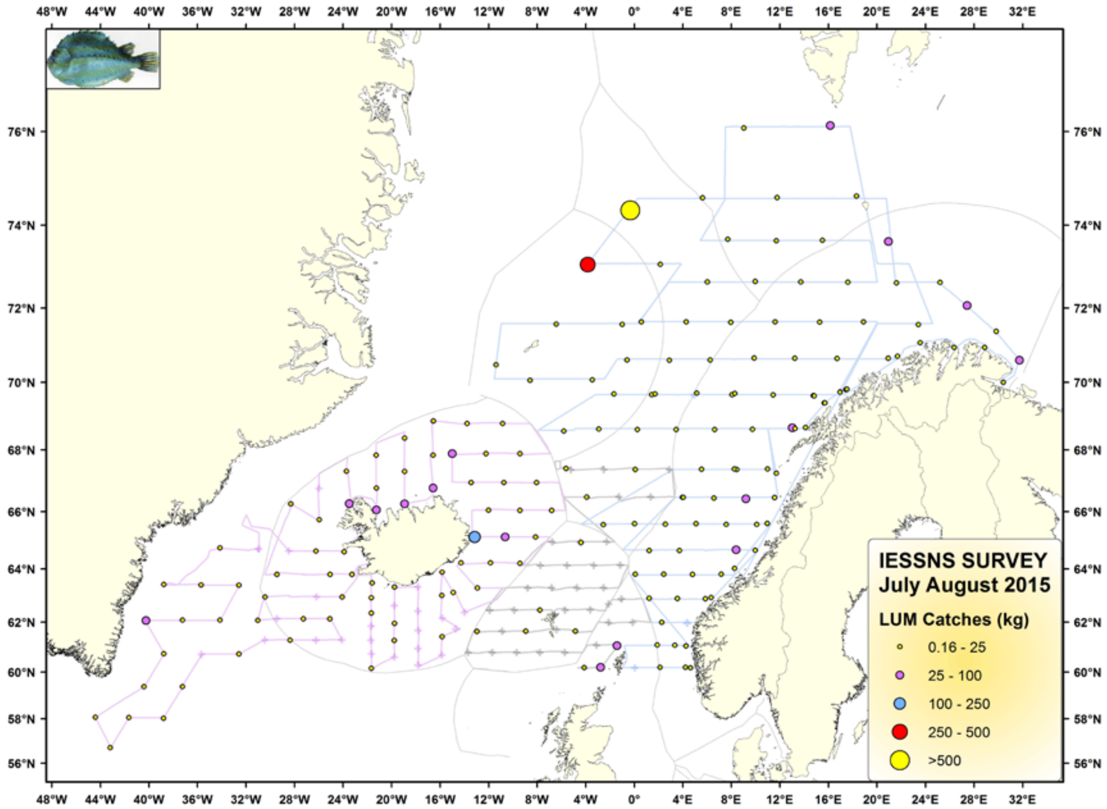


Figure 19. Lumpfish catches at surface trawl stations during the IESSNS survey in July 2016.

Salmon (*Salmo salar*)

North Atlantic salmon (*Salmo salar*) were caught in 28 stations both in coastal and offshore areas in the upper 30 m of the water column with the Multpelt 832 pelagic sampling trawl, during the 2016 IESSNS survey. The salmon weight ranged from 80 gram to > 5 kg in size, dominated by salmon weighing between 100 gram and 1 kg. The length of the salmon ranged from 18 cm to 75 cm, with a large majority of the salmon <30 cm in length.

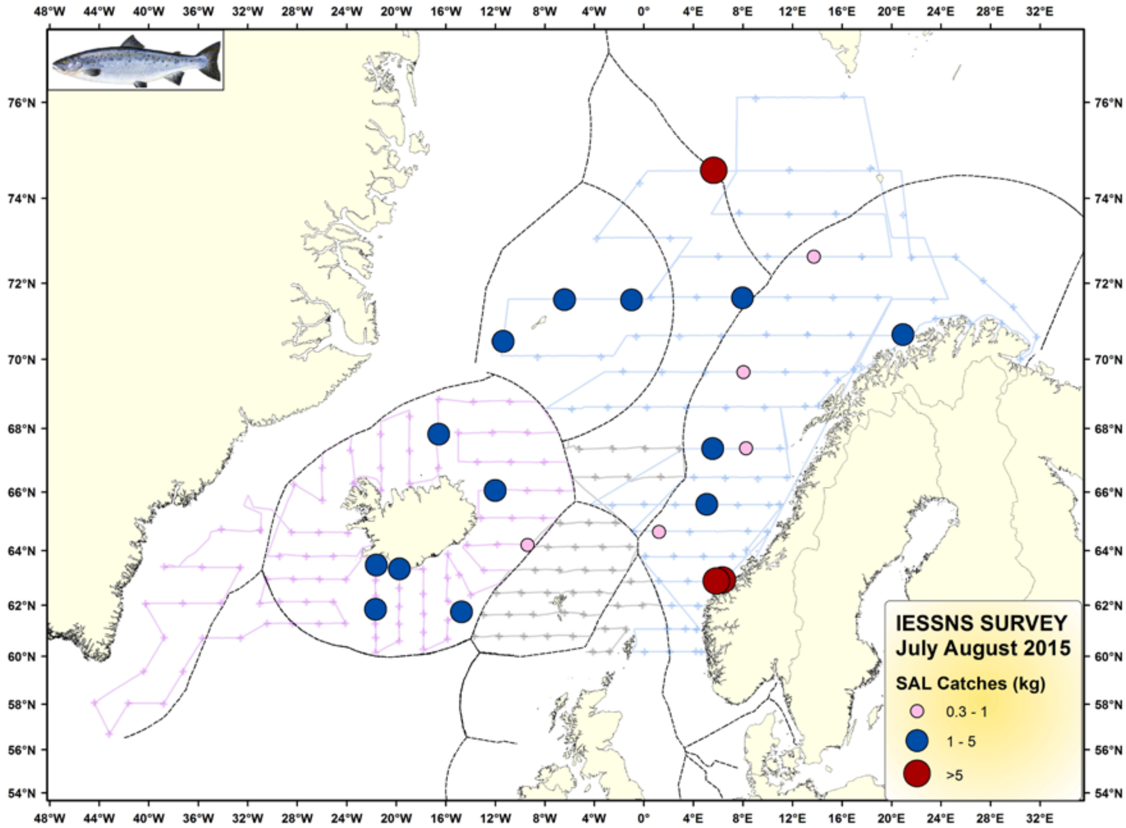


Figure 20. Catches of salmon at surface trawl stations during the IESSNS survey in July 2016.

4.7 Marine Mammals

Totally 700 marine mammals and 8 different species were observed onboard the two Norwegian vessels M/V "M. Ytterstad" and M/V "Vendla" from 1st to 30th of July 2016 (Figure 26). Altogether 5 groups of killer whales were found mostly in the eastern and western part of the Norwegian Sea in close association with mackerel. The species included fin whales, minke whales, humpback whales, pilot whales, killer whales, sperm whales, white-sided dolphins and white beaked dolphins. High densities of especially large groups of fin whales as well as some humpback whales were observed in the northern part of the Norwegian Sea, off the coast of Finnmark and into the southern part of the Barents Sea (Figure 26). Few marine mammals were sighted in the southern and central part of the Norwegian Sea (Figure 26).

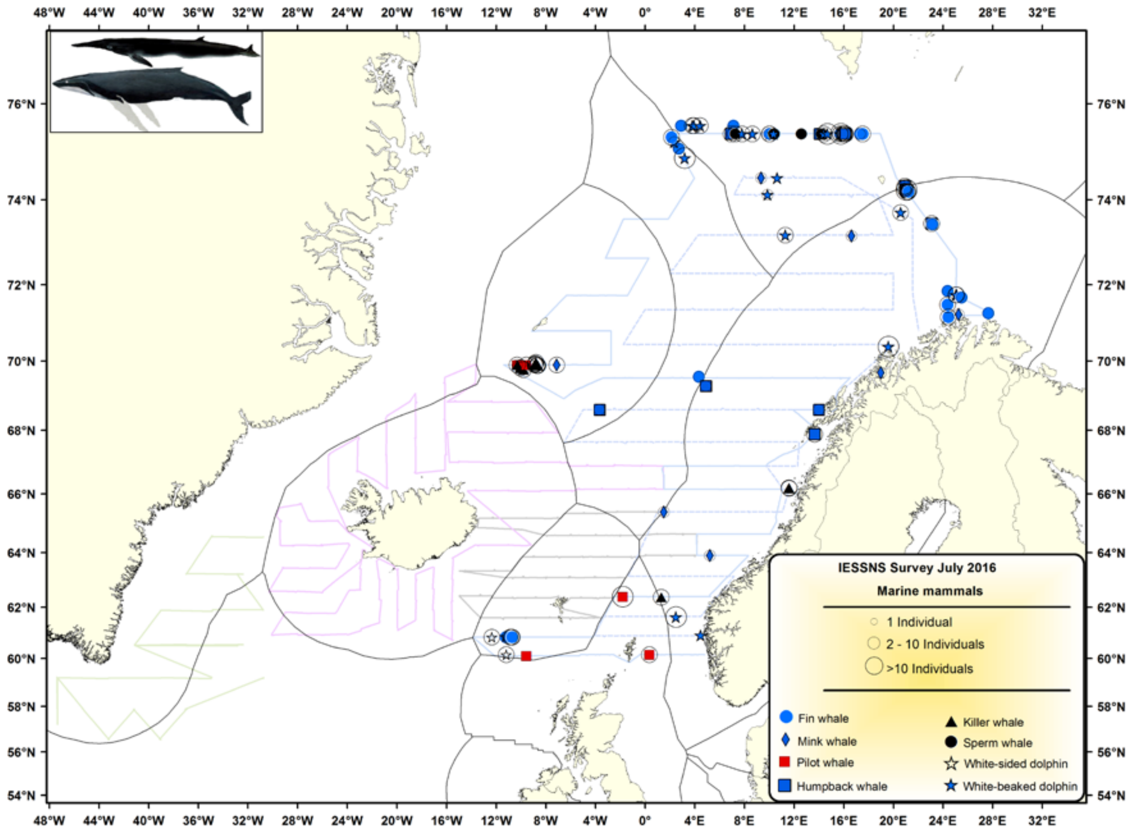


Figure 21. Overview of all marine mammals sighted onboard M/V "Vendla" and M/V "Ytterstad" in the Norwegian Sea and surrounding waters in July 2016.

5 Discussion

The international coordinated ecosystem survey in the Norwegian Sea and adjacent areas (IESSNS) was performed during 1-31 July 2016 by five vessels from Norway (2), Iceland (1), Faroes (1), and Greenland (1). The survey coverage was comparable to previous years and the same protocol was followed (ICES 2014b). A major part of the survey is a standardised surface trawling at predefined locations, which has been used for a swept area abundance estimation of NEA mackerel since 2007, although not in all years. The method is analogous to bottom trawl surveys run for many demersal stocks. In addition to the surface trawling, CTD, zooplankton sampling and marine mammals sightings are also parts of the IESSNS. Deep water trawling aimed on acoustic registrations were undertaken for the first time in the 2016 survey by all the vessels to identify species and size distribution for acoustic estimation of blue whiting and herring. This attempt was considered successful and the 2016 survey therefore provides abundance estimation of three pelagic fish stocks, i.e. mackerel, blue whiting and Norwegian spring-spawning herring.

The total swept area biomass index of mackerel in summer 2016 was the highest in the time-series, or 10.2 million tonnes distributed over an area of 3.0 million km^2, which gives an average density of 3.4 tonnes/km^2. The average density increased therefore from 2015 (2.9 tonnes/km^2) but is lower than in 2013 and 2014 (~3.6 tonnes/km^2). The 33% increase in biomass indices between 2015 and 2016 can partly be explained by addition of the 2014 year class (11% of the biomass), but also by a lower estimate in 2015 than from the years before. As such, the 2016 estimate is more along the 2014 and 2013 estimates for most of the year classes prior to 2012 (Table 7). This is also reflected in improvements of the internal consistency among the age-disaggregated abundance indices (Figure

14). The reason for the low estimates in 2015 is unknown, but as mentioned in last year's report (ICES 2015), it could be a consequence of both adult and juvenile mackerel being outside of the survey area (e.g. in the North Sea and north and west of the British Isles), or less fishable during surface trawling due to different behaviour including possible higher patchiness compared to previous years. Furthermore, this emphasize the necessity to cover the potential distribution areas further south (in the North Sea and west of the British Isles) as a part of IESSNS and recommended below.

The results indicate that the 2014 year class is strong, as it is the third highest in number in the IESSNS time-series for age 2 (Table 7). The size of the year class is still poorly determined but could be, according to these results, at similar level as the big 2010 year class. The 2015 year class was on the other hand hardly seen in the 2016 survey.

The internal consistency plot for age-disaggregated year classes has improved since the benchmark in 2014 by the inclusion of three more survey years. This is especially apparent for younger ages. There is now fair/good internal consistency for 1-10 years old mackerel (see Nøttestad et al. 2016b). The improved consistency for young NEA mackerel in the IESSNS survey should be taken into consideration by ICES WGWIDE, specifically by including estimates of younger mackerel 1-5 years of age, and not only age 6+ mackerel, from the IESSNS survey into the assessment of NEA mackerel abundance. This is also important since altogether 55% of the estimated number of mackerel was less than 6 years old and are therefore not used in current assessment.

The overlap between mackerel and NSS herring in July 2016 was highest in the south-western part of the Norwegian Sea (Faroe and east Icelandic area) according to the catch compositions in the survey (Figure 15). The spatio-temporal overlap between mackerel and herring in 2016 was similar to that in both 2014 and 2015. In the areas where herring and mackerel overlap an inter-specific competition for food between the species can be expected. According to Langøy *et al.* (2012), Debes *et al.* (2012), and Oskarsson *et al.* (2015) the herring may suffer in this competition, the mackerel had higher stomach fullness index than herring and the herring stomach composition is different from previous periods. Langøy et al. (2012) and Debes et al. (2012) also found that mackerel target more prey species compared to herring and mackerel may thus be a stronger competitor and more robust in periods with low zooplankton abundances. Mackerel is furthermore known to go with the flow and take advantage of the dominating Atlantic current (Nøttestad et al. 2016a).

This year's survey was better synchronized in time and was conducted over a shorter period than before (Figure 1). This was in harmony to recommendations put forward in last year's report on the timing and duration of the survey that the survey period should be four weeks with mid-point around 20 July. The main argument for this time frame, was to make the survey as synoptic as possible in space and time, and at the same time be able to finalize data and report for inclusion in the assessment for the same year.

In the IESSNS 2016 two acoustic biomass estimates were calculated using the newly developed StoX software, one for Norwegian spring-spawning herring and one for blue whiting. The survey plans were accommodated to include these two species in addition to mackerel. It was recommended by ICES (WGWIDE) to try to build up new abundance indices of NSS herring and blue whiting in addition to the indices obtained from the IESNS (herring) survey in May. The group considered the two biomass estimates to be of good quality, especially the blue whiting estimates was considered to be of higher quality than the similar estimate from the IESNS survey in May, since the coverage was better in July and by then also a larger part of the stock is likely to have migrated north and being found within the survey area. Consequently, the group recommends that blue whiting should be included in future IESSNS in order to build up a new time series index to be used in the biomass estimation of blue whiting in ICES (WGWIDE).

The acoustic abundance index of Norwegian spring-spawning herring was 20.2 billions corresponding to 6.75 million tonnes (Table 8). The abundance estimate of herring from the May survey was 21.9 billions corresponding to 5.4 million tonnes (ICES 2016/WGWIDE). The abundance estimates are slightly higher in July as compared to May while the biomass index was one third higher in July. This increase in biomass can be explained by the expected weight gain of herring during the feeding season from May to July (Homrum et al. 2016).

The acoustic abundance index of blue whiting was 29.8 billions corresponding to 2.3 million tonnes (Table 9). This is higher than the figure from the May survey in 2016. The acoustic abundance estimate of blue whiting in May 2016 was 20.0 billions corresponding to 1.55 million tonnes (ICES 2016/WGWIDE). However, in May a southern limit for the spatial coverage was a 62 degrees north while in the July survey it was 60 degrees north. Thus a higher proportion of the stock was covered during July than in May, and this is part of the discrepancy in the indices from the two periods. The acoustic estimate of blue whiting during the spawning season in March-April 2016 (IBWSS) was 34.4 billions, corresponding to 2.87 million tonnes (ICES 2016/WGWIDE), which is higher than the acoustic estimate during the IESSNS in July 2016. The IESSNS may underestimate larger blue whiting in the Norwegian Sea and surrounding waters during summer, due to low densities of larger individuals and thereby difficult to scrutinize dispersed concentrations of blue whiting acoustically in deep waters when they are feeding.

The obtained zooplankton biomass indices in this year's survey (Figure 9) were in a good agreement with the results of the IESNS survey in May (ICES, 2016), where slight increase in zooplankton was also observed in the Norwegian Sea and 50% reduction in the areas west of 2°W and northeast of Iceland (different definition of areas than in IESSNS). The latter can be compared to 50% reduction in Icelandic and Greenlandic waters from 2015 to 2016 in IESSNS. These plankton indices, however, needs to be treated with some care due to various amounts of phytoplankton species/groups between years and areas in the samples influencing the total amount of zooplankton, which is of relevance when considering available food for pelagic planktivorous fish.

The swept-area estimate was as in previous years based on the standard method using the average horizontal trawl opening by each participating vessel (ranging from 61 to 67 m; Table 5), assuming that all mackerel inside the trawl opening are caught, i.e. no escape through the meshes. Further, that no mackerel is distributed below the trawl. Uncertainties in such a method include e.g. possible escape of fish through the meshes leading to an underestimation of the estimate. If, on the other hand, mackerel is herded into the trawl paths by the trawl doors and bridles, the method overestimates the abundance. The swept-area method used currently consider all fish inside the trawl-opening to be caught in the cod-end. Further work on trawl capture efficiency will be undertaken in IESSNS.

6 Recommendations

Recommendation	To whom
The survey period should be restricted to maximum 4 weeks. The mid-point of the survey should be around 20 July each year to leave sufficient time for data analysis before report delivery at WGWIDE.	Norway, Faroe Islands, Iceland, Greenland
Research should be conducted to find the optimal timing of the survey in relation to i) precision of stock estimates and ii) ecological information (such as the widest distribution of the species which is not covered by other surveys such as spawning surveys).	Norway, Faroe Islands, Iceland, Greenland
Increase the survey effort in Greenlandic and international waters in the western part of the survey area by (i) decreasing the distance between standard trawl stations and (ii) extending the acoustic survey transects further towards land to cover the shelf	Greenland

edge where the blue whiting is known to be.	
Estimate the relationship between sampling distance and index precision.	Norway, Faroe Islands, Iceland, Greenland
The new additional goal of the 2016 IESSNS of obtaining acoustical indices of blue whiting and Norwegian spring-spawning herring was considered successful. Therefore the survey group recommends it to be continued in the IESSNS 2017, with as much effort as needed to cover the three pelagic stocks simultaneously and adequately in the Nordic Seas.	Norway, Faroe Islands, Iceland, Greenland
Encourage EU to join the IESSNS survey in order to obtain an even better synoptic and to include the southern part of the mackerel distribution during summer. Develop a method that can sample the mackerel representatively in the North West European shelf Seas south of the present survey area. Investigate the horizontal distribution and abundance of mackerel and if standardized trawling in the surface (0-30 m) can be used to measure the abundance of mackerel in the North West European shelf Seas south of the present survey area.	EU
The age disaggregated indices from IESSNS are considered to give a valid signal of year class sizes from age 1-10 as indicated by the consistency plots. It is therefore recommended that WGWIDE explore using the entire time and age series of biomass estimates from the IESSNS survey in the analytical assessment of the mackerel stock.	WGWIDE
We recommend that observers collect sighting information of marine mammals and birds on all vessels.	Norway, Faroe Islands, Iceland, Greenland

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8 Acknowledgements

We greatly appreciate and thank skippers and crew members onboard M/V "M. Ytterstad", M/V "Vendla", M/V "Trøndur i Grøtu", M/V Finnur Fríði and R/V "Árni Friðriksson" for outstanding collaboration and practical assistance on the joint mackerel-ecosystem IESSNS cruise in the Nordic Seas from 1st to 31st of July 2016.

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10 Annex 1

Swept area biomass estimates in the different exclusive economical zones (EEZs)

Allocation of the total swept area estimate of mackerel biomass to exclusive economic zones (EEZs) given in Table A1 was done in R with a selection of spatial packages (see 'Task View: Spatial' on http://cran.r-project.org). These included notably 'rgeos' for polygon clipping, and package 'geo' (http://r-forge.r-project.org), i.e. for rectangle manipulation and graphical presentation (R Development Core Team 2014, Bivand and Rundel 2014, Björnsson et al. 2014). EEZs in the Northeast Atlantic were taken from shape files available on http://marineregions.org (low resolution version, downloaded in late 2012 as: World_EEZ_v7_20121120_LR.zip).

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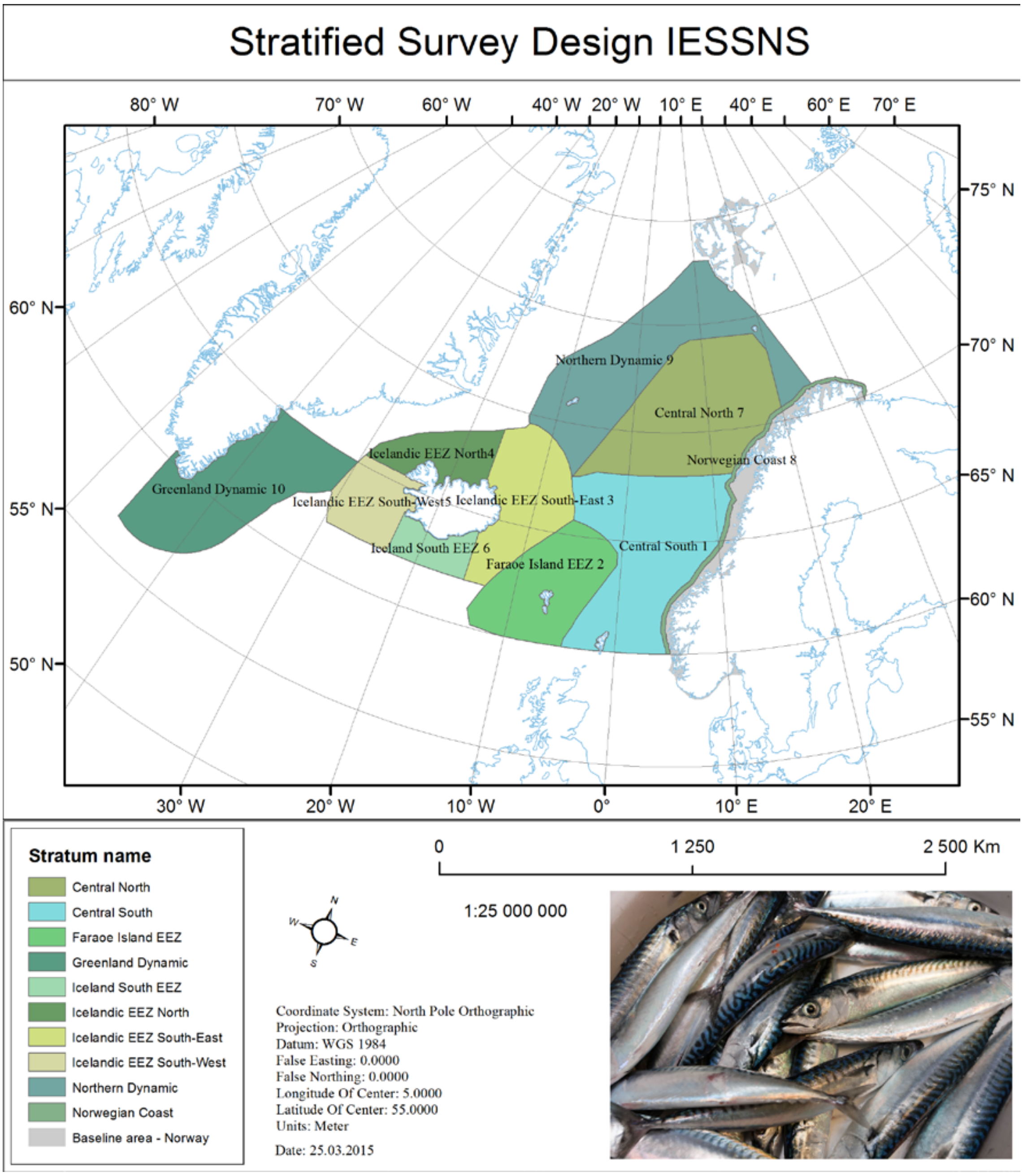
Table A1. Swept area estimates of NEA mackerel biomass in the different Exclusive Economic Zones (EEZs) according to the international coordinated ecosystem (IESSNS) survey in July 2016. Area calculated from rectangles where mackerel was present.

EEZ/Int area	Area (1000' km)	Biomass (1000' tonnes)	Biomass %
EU	101	401	3.92 %
Norway	726	1843	18.01 %
Iceland	644	3134	30.63 %
Faroese	268	949	9.27 %
Jan Mayen	205	663	6.48 %
International north	280	1356	13.25 %
International west	212	734	7.17 %
Greenland	424	1026	10.03 %
Spitzbergen	141	127	1.24 %
Total	3001	10233	100.00 %

11 Annex 2


Stratified Survey Design IESSNS
80° W
70° W
60° W
40° W
20° W
10° E
40° E
60° E
70° E
75° N
70° N
65° N
60° N
55° N
60° N
55° N
50° N
30° W
20° W
10° W
0°
10° E
20° E
Northern Dynamic 9
Central North 7
Norwegian Coast 8
Icelandic EEZ North4
Greenland Dynamic 10
Icelandic EEZ South-West5
Icelandic EEZ South-East 3
Iceland South EEZ 6
Faraoe Island EEZ 2
Central South 1
Stratum name
Central North
Central South
Faraoe Island EEZ
Greenland Dynamic
Iceland South EEZ
Icelandic EEZ North
Icelandic EEZ South-East
Icelandic EEZ South-West
Northern Dynamic
Norwegian Coast
Baseline area - Norway
0
1 250
2 500 Km
1:25 000 000
N
W
E
S
Coordinate System: North Pole Orthographic
Projection: Orthographic
Datum: WGS 1984
False Easting: 0.0000
False Northing: 0.0000
Longitude Of Center: 5.0000
Latitude Of Center: 55.0000
Units: Meter
Date: 25.03.2015

Annex 5: Individual survey cruise reports

Annex 5a: Western Baltic - GERAS/Baltic International Acoustic Survey (BIAS)

Survey Summary table	
Name of the survey (abbreviation):	GERAS / BIAS (GER)
Summary:	
The objectives of the survey were carried out successfully and as planned in most of the covered ICES Subdivisions. Persisting adverse weather conditions through some periods of the survey required repeated shifts of surveyed areas to not lose too much survey time. Due to bad weather and an according loss of survey time, the two northernmost ICES statistical rectangles in SD21 could not be covered as planned. Altogether, 55 trawl hauls were carried out during the survey providing biological data for age stratified abundance estimation of target species herring and sprat. Measured NASC values per 1 nmi EDSU were distinctly higher in most parts of the survey area in comparison to previous years (and also often in comparison to the long-term survey mean). Abundance and biomass of sprat showed significant increases in comparison to 2015 while in herring, numbers increased but overall biomass decreased by ca. 40%. Large, mature herring in their overwintering aggregations in SD23 were for the first time in many years virtually absent. Survey effort, timing and coverage were comparable to previous years.	
	Description
Survey design	Stratified systematic (parallel where applicable) design. Start point not randomized.
Index Calculation method	GERIBAS Software. Index based on mean NASC per ICES statistical rectangle.
Random/systematic error issues	Survey design and transects restricted by area topography. No fully systematic coverage of survey area possible.
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	Significant bubble sweep down covering the majority of the water column in shallow areas of SD21 due to adverse weather conditions.
Extinction (shadowing)	No particular issues as targets are scattered throughout the water column in loose aggregations in most of the surveyed areas.
Blind zone	Night-time distribution of clupeids in surface layers (i.e. within blind zone and near-field) is likely to occur but is not quantified.
Dead zone	No particular issue as clupeids are mostly distributed pelagic and away from seafloor during night-time survey operations.
Allocation of backscatter to species	Directed trawling. Mixed species category applied throughout survey. Species allocations based on combined trawl haul composition (per ICES statistical rectangle).
Target strength	Recommended values for target species.
Calibration	All survey frequencies calibrated and results within recommended tolerances.

Survey report for FRV "Solea"

German Acoustic Autumn Survey (GERAS)

30 September – 20 October 2016

Matthias Schaber [1] & Tomas Gröhsler [2]
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1 INTRODUCTION

Background: The joint German/Danish GERAS survey is part of the Baltic International Acoustic Survey (BIAS), which is co-ordinated by the Baltic International Fish Survey Working Group (WGBIFS) and is conducted within the scope of the ICES Working Group for International Pelagic Surveys (WGIPS). Further WGBIFS contributors to the Baltic survey are national fisheries research institutes of Sweden, Poland, Finland, Latvia, Estonia, Lithuania and Russia. FRV "Solea" participated for the 29th time. The survey area covered the western Baltic Sea including Kattegat, Belt Sea, Sound and Arkona Sea (ICES Subdivisions 21, 22, 23 and 24). The survey effort was comparable to former years.

Objectives: The survey has the main objective to annually assess the clupeoid resources of herring and sprat in the Baltic Sea in autumn. The reported acoustic survey is conducted every year to supply the ICES

- Herring Assessment Working Group for the Area South of 62°N (HAWG) and
- Baltic Fisheries Assessment Working Group (WGBFAS)

with an index value for the stock size of herring and sprat in the Western Baltic area (Kattegat/Subdivisions 21 and Subdivisions 22, 23 and 24).

2 SURVEY DESCRIPTION & METHODS

2.1 Personnel

Name	Function	Institute
30.09.-01.10.2016 / Calibration of hydroacoustic equipment		
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
M. Drenckow	Hydroacoustics	TI-SF
S.-E. Levinsky	Fishery biology	DTU Aqua, Charlottenlund, (DK)
B. Stefanowitsch	Student assistant	TI-SF
S. Wieser	Student assistant	TI-SF
01.-20.10.2016 / Survey		
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
Dr. T. Gröhsler	Hydroacoustics, Cruise leader	TI-OF (01.-08.10.)
A. Bühler	Fishery biology, Student assistant	TI-OF (09.-20.10.)
M. Koth	Fishery biology	TI-OF (01.-09.10.)
S.-E. Levinsky	Fishery biology	DTU Aqua, Charlottenlund, (DK)
B. Stefanowitsch	Student assistant	TI-SF
S. Wieser	Student assistant	TI-SF

2.2 Narrative

The 726th cruise of FRV "SOLEA" represents the 30th subsequent GERAS survey. FRV "SOLEA" left the port of Kiel harbor on 30 September 2016. The acoustic survey covered the southern part of Subdivision (SD) 21 and the whole area of SD 22, 23 and 24. The northern part of SD 21 could not be covered because of a loss of survey time due to unfavorable weather conditions. Due to varying weather conditions in the survey area the following survey schedule was accomplished:

- Arkona Sea (SD 24) 01. - 03.10.
- Belt Sea (SD 22) 03. - 07.10.
- Arkona Sea (SD 24) 09. -10.10.
- Sound (SD 23) 10. -11.10.
- Kattegat (SD 21) 11. - 13.10.
- Arkona Sea (SD 24) 16. - 17.10.
- Sound (SD 23) 18. - 19.10.

The survey ended on 20 October 2016 in Rostock/Marienehe.

2.3 Survey design

ICES statistical rectangles were used as strata for all Subdivisions (ICES, 2014). The area was limited by the 10 m depth line. The survey area in the Western Baltic Sea is characterised by a number of islands and sounds. Consequently, parallel transects would lead to an unsuitable coverage of the survey area. Therefore a zig-zag track was adopted to cover all depth strata regularly and sufficiently. Overall regular cruise track length was 1 179 nmi covering a survey area of 12 400 nmi^2 (Figure 1).

2.4 Calibration

Both transducers (38 kHz and 120 kHz) were calibrated prior to the beginning of the survey in initially inclement but increasingly improving weather conditions from a drifting vessel in Strande Bay/Kiel Bight. Overall calibration results were considered good based on calculated RMS values. Resulting transducer parameters were applied for consecutive data-collection and post-processing of hydroacoustic survey data.
The calibration procedure was carried out as described in the "Manual for the Baltic International Acoustic Surveys (BIAS)" (ICES, 2014). Calibration results for the 38 kHz transducer are given in Table 1.

2.5 Acoustic data collection

All acoustic investigations were performed during night time to account for the more pelagic distribution of clupeids during that time. The main pelagic species of interest were herring and sprat. The acoustic equipment used was a Simrad scientific echosounder EK80 operated in continuous wave mode at 38 kHz (120 kHz). Specific settings of the hydroacoustic equipment were used as described in the "Manual for the Baltic International Acoustic Survey (BIAS)" (ICES, 2014). Corresponding settings are listed in Table 1. Echo-integration, i.e. the integration and allocation of NASC values to species abundance and biomass was accomplished using EchoView 7 post-processing software Echoview Software Pty Ltd (2016). Mean volume back scattering values (s_v) were integrated over 1 nmi intervals from 10 m below the surface (or depending on surface turbulence) to ca. 0.5 m over the seafloor. Interferences from surface turbulence, bottom structures and scattering layers were removed from the echogram.

2.6 Biological data – fishing trawls

Trawl hauls were conducted with a pelagic gear "PSN388" in midwater layers as well as near the seafloor. Mesh size in the codend was 10 mm. It was planned to carry out at least two hauls per ICES statistical rectangle. Both trawling depth and net opening were continuously controlled by a netsonde during fishing operations. Trawl depth was chosen in accordance with echo distributions on the echogram. Normally, a vertical net opening of about 7-9 m was achieved. The trawling time usually lasted 30 minutes but was shortened when echograms and netsounder indicated large catches. From each haul sub-samples were taken to determine length and weight of fish. Samples of herring and sprat were frozen for additional investigations (e.g. determining sex, maturity, age).

2.7 Hydrographic data

Hydrographic conditions were measured after each trawl haul and in regular distances on the survey transect. On each corresponding station, vertical profiles of temperature, salinity and oxygen concentration were measured using a "Seabird SBE 19 plus" CTD. Water samples for calibration purposes (salinity) were taken on every station, while water samples for Winkler titration and calibration of oxygen measurements were taken and processed at least once per day. Altogether, 81 CTD-profiles were measured (Fig. 5).

2.8 Data analysis

The pelagic target species sprat and herring are often distributed in mixed layers together with other species. Thus, echorecordings cannot be allocated to a single species. Therefore the species composition allocated to echorecordings was based on corresponding trawl catch results. For each rectangle species composition and length distributions were determined as the unweighted mean of all trawl results in this rectangle. From these distributions the mean acoustic cross section σ was calculated according to the following target strength-length (TS) relation:

	TS	References
Clupeoids	= 20 log L (cm) - 71.2	ICES 1983
Gadoids	= 20 log L (cm) - 67.5	Foote et al. 1986

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section (s_A) and the rectangle area, divided by the corresponding mean cross section. The total number was separated into herring and sprat according to the mean catch composition.
In accordance with the guidelines in the "Manual for the Baltic International Acoustic Surveys (BIAS)" (ICES, 2014) further calculations were performed as follows:

Fish species considered:

Clupea harengus
Engraulis encrasicolus
Gadus morhua
Gasterosteus aculeatus
Melanogrammus aeglefinus
Merlangius merlangus
Pollachuis pollachius
Pollachius virens
Sprattus sprattus
Trisopterus esmarkii

Exclusion of trawl hauls with very low catch level:

Haul No.	Rectangle	Subdivision (SD)
19, 22	40G0	22
32	41G2	23
52	39G2	24
53	40G2	23

Despite low catch levels of both herring and sprat the following hauls were not excluded from the analysis as they were the only trawl hauls conducted in the corresponding rectangles and thus provided the only available information on species composition in these rectangles:

Haul No.	Rectangle	Subdivision (SD)
20	41G0	22
42	41G0	21

Usage of neighbouring trawl information for rectangles which contain only acoustic investigations:

Rectangle/SD to be filled	with Haul No.	of Rectangle/SD
40F9/22	18	40G0/22
39G2/23	45	39G2/24
37G4/24	5, 8	38G4/24

3 RESULTS

3.1 Acoustic data

Statistics on survey area, mean S_A (NASC), mean scattering cross section σ, estimated total number of fish, as well as proportion of herring and sprat per SD/rectangle are shown in Table 6.

During the survey, hydroacoustic data were recorded at a standard ship speed of 10 kn leading to daily transect lengths of roughly 90 to 100 nmi. Figure 2 depicts the spatial distribution of mean NASC values (5 nmi intervals) measured on the hydroacoustic transects covered in 2016. In almost all rectangles surveyed, mean NASC values were significantly higher than those recorded in 2015, often also higher than those recorded in 2014, and –in SD24- also above the long-time survey average. On ICES subdivision scale, mean NASC values were higher than in the previous year in SD 21, 22 and 24 while in SD 23 mean NASC values were significantly lower than in preceding years.

In SD 21, overall NASC values measured were comparatively low, but mean NASC per 1 nmi EDSU was – occasionally significantly- higher in almost all rectangles observed than in the previous year, but mostly lower than the long-time survey average in all rectangles surveyed. Rectangles with increased aggregations of clupeids (43G1 and 43G2) in the northern part could not be covered due to adverse weather conditions. Increased aggregations were instead measured in the southwestern part of SD 21.

In SD 22, mean NASC values recorded were higher than the previous year in all but one rectangles surveyed. In comparison to the long-term survey mean of rectangles in SD 22, the NASC measured was lower in the majority of rectangles. No clear aggregations of clupeids were measured, but overall NASC values were increased compared to previous years almost along the whole survey transect covered. However, in the short transect section covering rectangle 40G1, NASC values were many times higher than the values observed in the years before and also than the long-term survey mean.

The large aggregations of big herring that can be observed annually in SD 23 in the Öre Sound were not present in autumn 2016. NASC values in rectangle 40G2 covering the aggregation hotspot in this area were significantly lower than the high levels measured in 2015 (only 13% of the measured values in 2015) and also only ca. 40% of the long-time survey average. Measurements were made in inclement weather conditions with strong currents in the Sound. A replicate measurement of the transect in SD 23 in good weather conditions a few days later corroborated these findings.

3.2 Biological data

In total 55 trawl hauls were conducted:

Subdivision	No. of Hauls
21	12
22	17
23	6
24	20

Altogether, 1 501 individual herring, 749 sprat, 535 European anchovies and 42 sardines were frozen for further investigations (e.g. determining sex, maturity, age). Results of catch compositions by Subdivision are presented in Tables 2-5. Altogether, 49 different species were recorded. Herring were caught in 52, sprat in 51 hauls. SD 23, which is typically characterized by the highest mean catch rates per station (kg 0.5 h^{-1}), showed the lowest values ever recorded. In contrast to the last year where sardines (*Sardina pilchardus*) were not caught at all, this species did appear in 2016 catches in SDs 22-24. As in previous years, anchovy (*Engraulis encrasicolus*) were present in most catches. Anchovies were caught throughout the survey area in 41 out of 55 hauls, including the majority of hauls in SD 21 and SD 22.

Figures 3 and 4 show relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2015 and 2016. Compared to results from the previous survey in 2015, the following conclusions for herring can be drawn (Fig. 3):

- As in 2015, catches in SD 21 showed a bimodal distribution characterized by the presence of the incoming year class (≤15 cm) and older herring (>15 cm). In contrast to 2015, the fraction of the incoming year class was higher in 2016.
- SD 22 showed the incoming year class with a mode at 9.75 cm while in 2015 this mode had been observed at 10.75 cm. A rather low fraction of older fishes showed in both years another comparable mode (17.25 cm in 2016 and at 16.75 cm in 2015).
- In SD 23, smaller herring (< 20 cm) dominated catches. This was in contrast to the dominant contribution of larger herring (>20 cm) in previous years.
- In SD 24, the herring length-frequency distribution was characterized by a similar contribution of the incoming year class (≤15.00 cm) and older herring (>15 cm) in both years.
- Altogether, the present contribution of the incoming year class (ca. <15 cm) seemed to be quite similar in the last two years.

Relative length-frequency distributions of **sprat** in the years 2015 and 2016 (Fig. 4) can be characterized as follows:

- In SD 21 catch numbers of the incoming year class (≤10 cm) were virtually absent in both years. The catches were dominated by the contribution of larger sprat (ca. >10 cm).
- In SD 22 and 23 catch numbers of the incoming year class (≤10 cm) dominated in 2016, whereas they were almost virtually absent in 2015. The dominant high contribution of larger sprat (ca. >10 cm) in 2015 disappeared in 2016.
- In SD 24, the sprat length-frequency distribution was rather similar compared to 2015 with a bimodal distribution of both incoming year class (< 10 cm) and older sprat.
- Altogether, the present contribution of the incoming year class (ca. <10 cm) increased compared to last year's very low value.

3.3 Biomass and abundance estimates

In the western Baltic, the distribution areas of two stocks, the Western Baltic Spring Spawning herring (WBSSH) and the Central Baltic herring (CBH) overlap. Survey results from recent years indicated that in SD 24, which is part of the WBSSH management area, a considerable fraction of CBH is present and correspondingly erroneously allocated to WBSSH stock indices (ICES, 2013). Accordingly, a stock separation function (SF) based on growth parameters derived from 2005 to 2010 has been developed to quantify the proportion of CBH and WBSSH in the area (Gröhsler et al., 2013; Gröhsler et al., 2016). The estimates of the growth parameters based on baseline samples of WBSSH and CBH in 2011-2015 and in 2016 support the applicability of SF (Oeberst et al., 2013, WD Oeberst et al., 2014; WD Oeberst et al., 2015; WD Oeberst et al., 2016; WD Oeberst et al., 2017). Beside in SD 24, the SF was finally also applied to ICES rectangle 39G2 (SD 23 area) since biological samples of 39G2 (SD 24 area) were used to raise the corresponding recorded Sa values.

The age-length distribution of herring in SD 22 in 2015 for the second time indicated a higher contribution of older fish of CBH origin. Thus, the SF was also applied in SD 22.

The ICES Herring Assessment Working Group for the area south of 62° N (HAWG)) is yearly supplied with an index for this survey (GERAS), which now excludes CBH in 2005-2016 and in general covers the total standard survey area, excluding ICES rectangles 43G1 and 43G2 in SD 21 and 37G3 and 37G4 in SD 24, which were not covered in 1994-2004.

3.3.1 Estimates incl. Central Baltic herring (CBH)

The total abundance of herring and sprat is presented in Table 6. Estimated numbers of herring and sprat by age group and SD/rectangle are given in Table 7 and Table 10. Corresponding mean weights by age group and SD/rectangle are shown in Table 8 and Table 11. Estimates of herring and sprat biomass by age group and SD/rectangle are summarised in Table 9 and Table 12.

The **herring** stock in Subdivisions 21-24 was estimated to be 4.9 x 10^9 fish (Table 7) or 139.1 x 10^3 tonnes (Table 9). For the included area of Subdivisions 22-24 the number of herring was calculated to be 4.3 x 10^9 fish or 129.1 x 10^3 tonnes. Last year's higher contribution of age 2, was now recorded at age 3 (Figure 3 and Table 7).

The estimated **sprat** stock in Subdivisions 21-24 was 26.6 x 10^9 fish (Table 10) or 195.1 x 10^3 tonnes (Table 12). For the included area of Subdivisions 22-24 the number of sprat was calculated to be 22.9 x 10^9 fish or 175.1 x 10^3 tonnes. As in 2015, the overall abundance estimate was dominated by the incoming year class (Figure 4 and Table 10).

3.3.2 Estimates excl. Central Baltic herring in SDs 22&24

Estimated numbers of **herring excluding CBH** in SDs 22-24 by age group and SD/rectangle for 2016 are given in Table 13. Corresponding herring mean weights by age group and SD/rectangle are shown in Table 14. Estimates of herring biomass excluding CBH by age group and SD/rectangle are summarised in Table 15. Removal of the CBH fraction in SDs 22 and 24 from herring GERAS index in 2016 resulted in biomass reductions of 29.4 % with corresponding reductions in numbers of 18.7 % (-35.7 % and -25.6 %, respectively in 2015; Figure 5).

3.4 Hydrographic data

In addition to the trawl hauls, vertical profiles of temperature, salinity and oxygen concentration were measured on a station grid covering the whole survey area. Altogether, hydrography profiles were measured on 81 stations. CTD stations as well as horizontal gradients of temperature, salinity and oxygen concentration both at the surface and at the seafloor are displayed in Figure 6.

Surface temperatures ranged from ca. 12°C in the Kattegat, Sound and northern Arkona Sea to almost 18°C in the southern Arkona Sea and the Kiel Bight. Bottom temperatures were also comparatively and similarly high in the southern part of the survey area but decreased to less than 8 °C in the deep parts of the southeastern Arkona Sea/western Bornholm Basin.

Surface salinities showed a large gradient from ca. 7 PSU in the eastern Arkona Sea to ca. 16 PSU in the Kiel Bight and over 20 PSU in the Kattegat. Salinity near the seafloor ranged from 8 PSU in the Arkona Sea to ca. 33 PSU in the Kattegat. Especially in the Sound, a very strong stratification with steep salinity gradients was observed.

Surface waters were well oxygenated throughout the survey area, while especially in the northern parts of the Sound as well as in the inner, southeastern Mecklenburg Bight and the norther Kiel Bight as well as in eastern parts of the Kattegat low levels, as well as in comparatively large areas anoxic conditions were observed.

4 DISCUSSION

Compared to 2015, the present estimates of **herring (incl. CBH)** show an increase in stock numbers, whereas stock biomass notably decreases:

Herring	Difference compared to 2015	
Area	Numbers (%)	Biomass (%)
Subdivisions 22-24	15	-40
Subdivisions 21-24	33	-42

The significant increase in numbers in 2016 was mainly caused by some higher numbers of the incoming year class, whereas the decrease in biomass was mainly driven by lower biomass estimates of age groups 1+ in SD 23. However, the strength of the new incoming year class in 2016, which is even assumed not to deliver an quantitative adequate index of the 0-group due to the survey design (mesh size of the gear in the codend; not covering possible inshore shallow water areas), was still far below the long-term average (2016: 2.7 x 10^9 million; average 1994-2015: 4.4 x 10^6 million).

Only very few older and bigger herring were recorded in SD 23 and SD 24 in 2016. The application of SF and the exclusion of CBH (Gröhsler et al., 2013; Gröhsler et al., 2016) in turn lead to the further decrease of older and bigger herring in 2016.

The large herring usually observed and dominant in SD 23 (the Sound), which is seen as an important transition and aggregation area for the WBSSH stock during its spawning migration (Nielsen, 1996), were in 2016 virtually absent for the first time in many years. This complete absence could be explained by delayed immigration of WBSSH from the feeding areas in the Skagerrak in 2016 (however, no large herring were observed there). The exceptionally low numbers of large and older herring could also be explained by the very low recruitment, which was recorded by the N20 during the last years. The sustained downward trend in recruitment could explain the disappearance of older herring in time. A strong correlation of N20 with the 1-age group (Annex: RHLS-Report) of GERAS supports this assumption.

As in the year before, some few older and bigger herring were detected in SD 24. However, exclusion of CBH in SD 24 led to almost elimination of older and bigger herring in this area. This was in contrast to the 2015 results, where some older and bigger herring already had started to migrate out of the Sound (SD 23) into SD 24.

In SDs 21 and 23 an increasing number of herring were observed that according to their age and length (e.g. age 3, total length 15 cm) could be allocated to CBH with a high degree of probability. Hence, CBH seem to have migrated into SD 21 and SD 23 in low numbers for the first time observed. This immigration has been observed in past years, albeit only in single individuals. Analysis of 2016 data validating the SF indicates that a further reduction of big herring together with immigration of CBH in SD 21 and SD 23, when being used as basis sample for WBSSH, can lead to problems with estimating SF parameters and their utilization.

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6 FIGURES AND TABLES

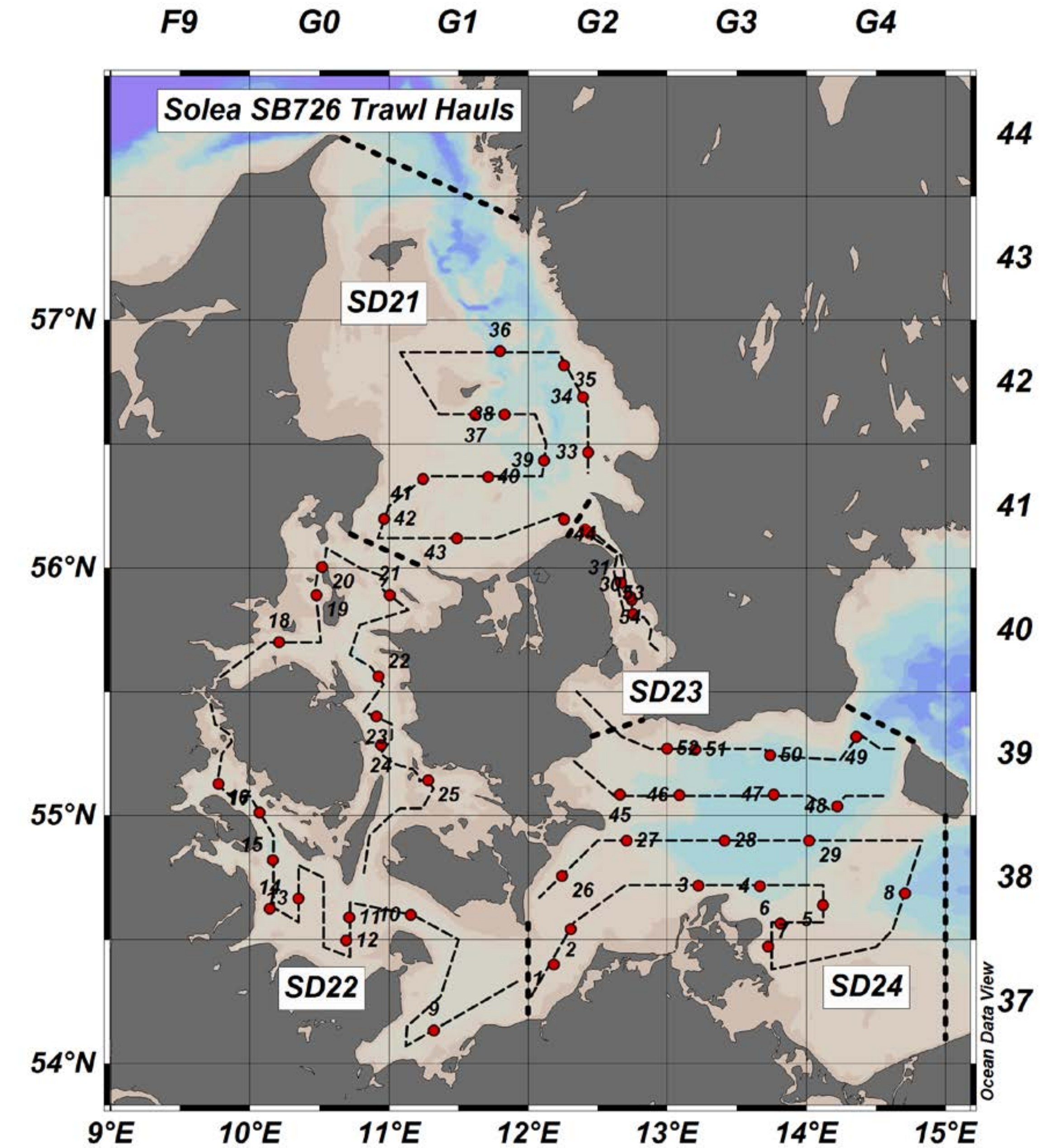


Figure 1: FRV "Solea" cruise 726/2016. Cruisetrack (thin dashed lines) and fishery hauls (red dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

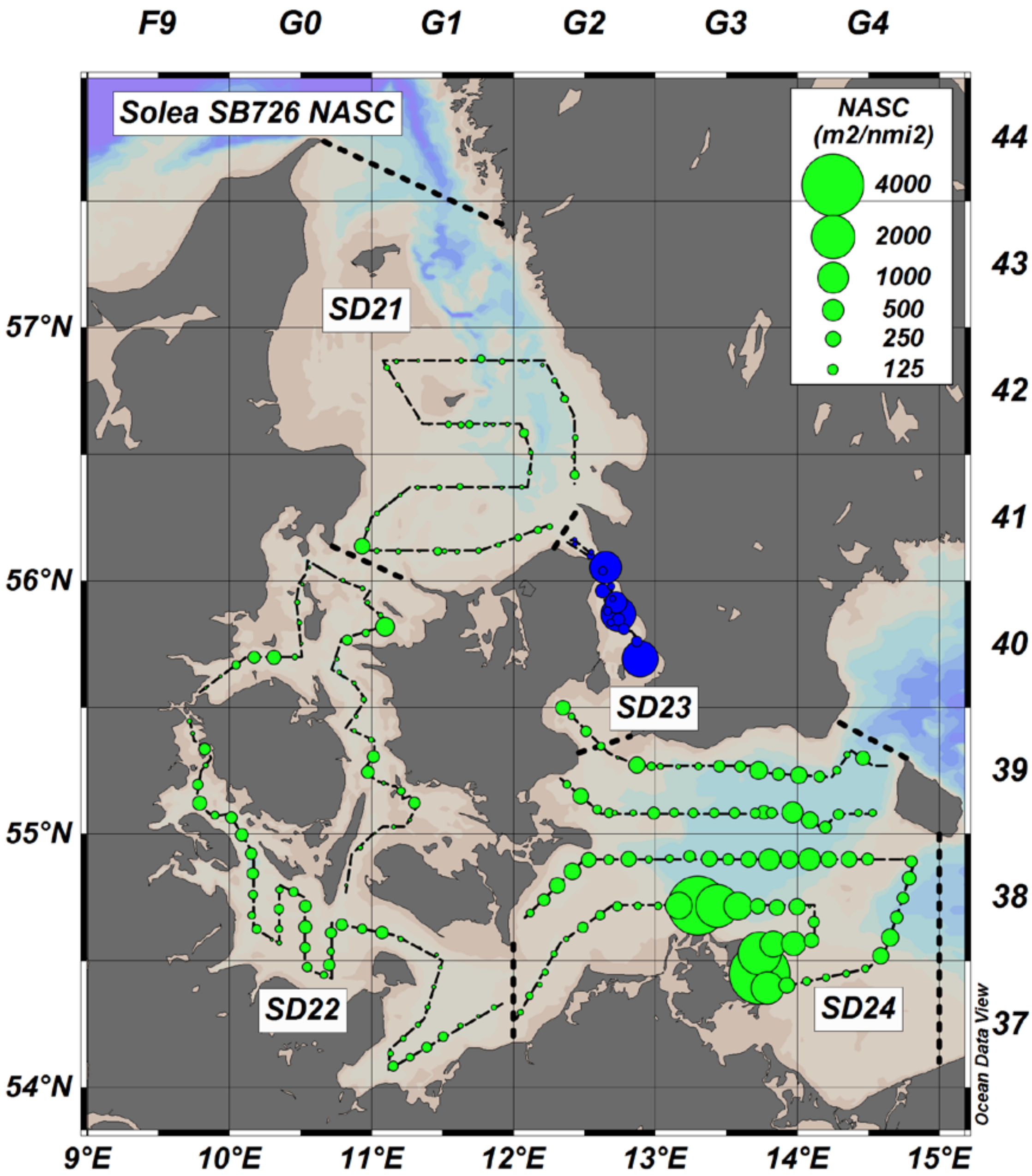


Figure 2: FRV "Solea" cruise 726/2016. Cruisetrack (thin dashed lines) and mean NASC (5 nmi intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD). Blue NASC values in Subdivision 23 (Sound) represent mean of two recordings.

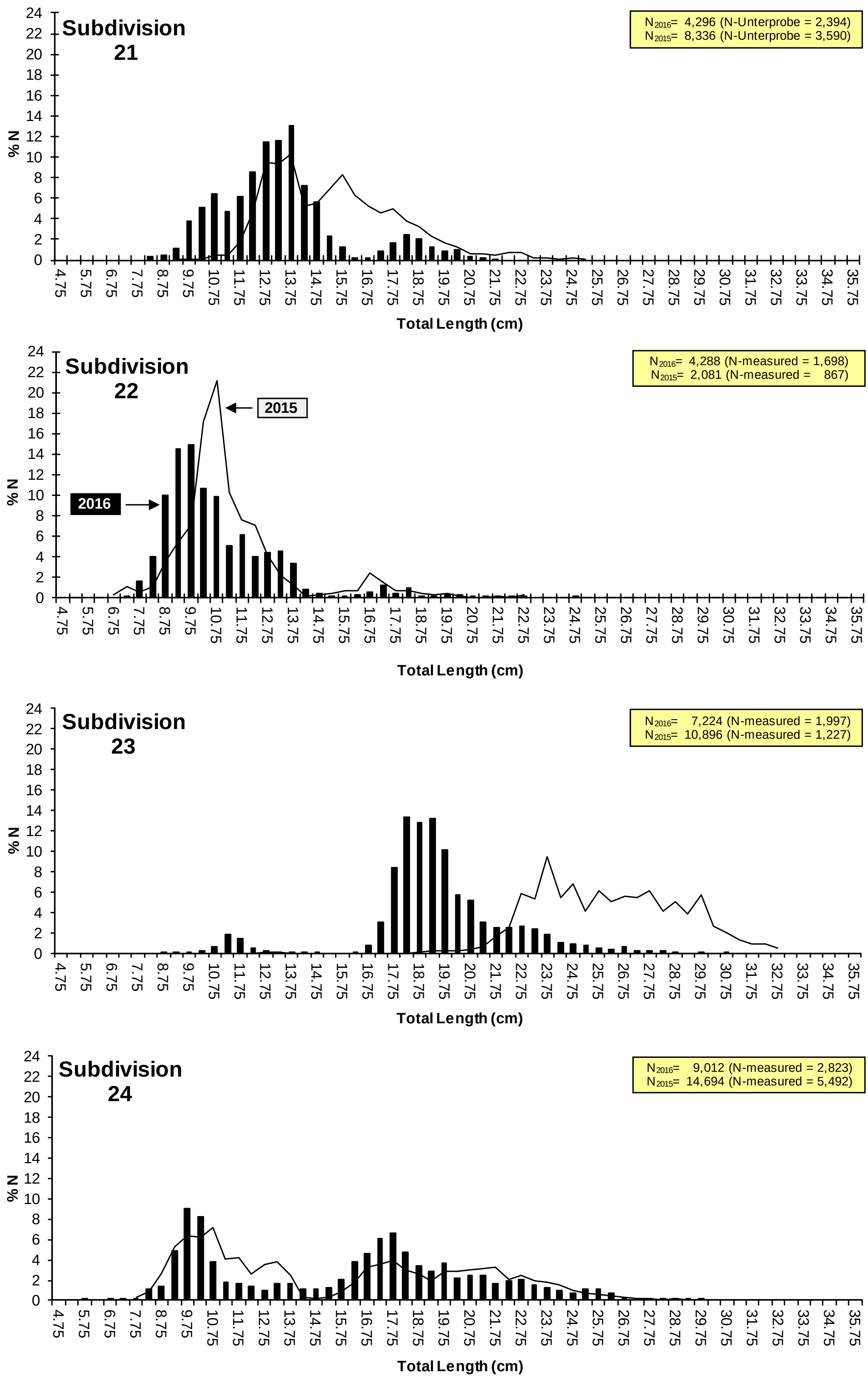


Figure 3: FRV "Solea," cruise 726/2016: Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 710/2015).

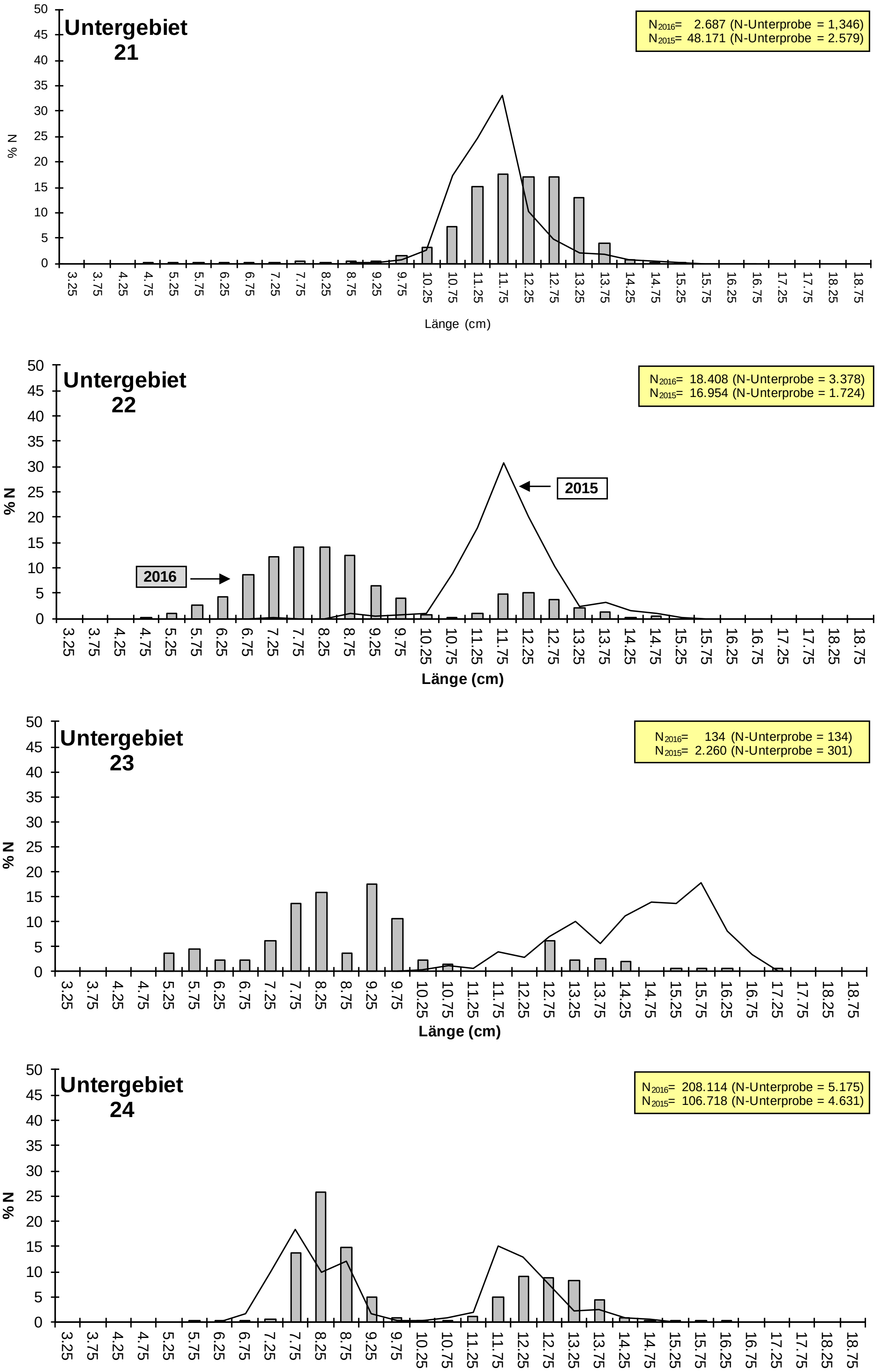


Figure 4: FRV "Solea", cruise 726/2016: Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 710/2015).

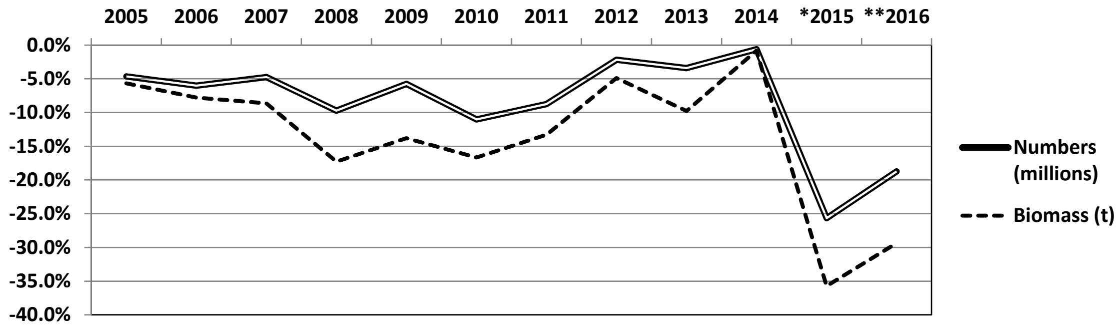


Figure 5 **Relative changes in abundance and biomass of Western Baltic Spring Spawning herring in ICES Subdivisions 21-24 (2005-2016) after application of the stock separation function (SF, Gröhsler et al., 2013) to the abundance and biomass index generated from German acoustic survey data (GERAS). *2015 = excl. CBH also in SD 22 and mature herring (stages ≥6) in SD 23; ** = . excl. CBH also in SD 22**

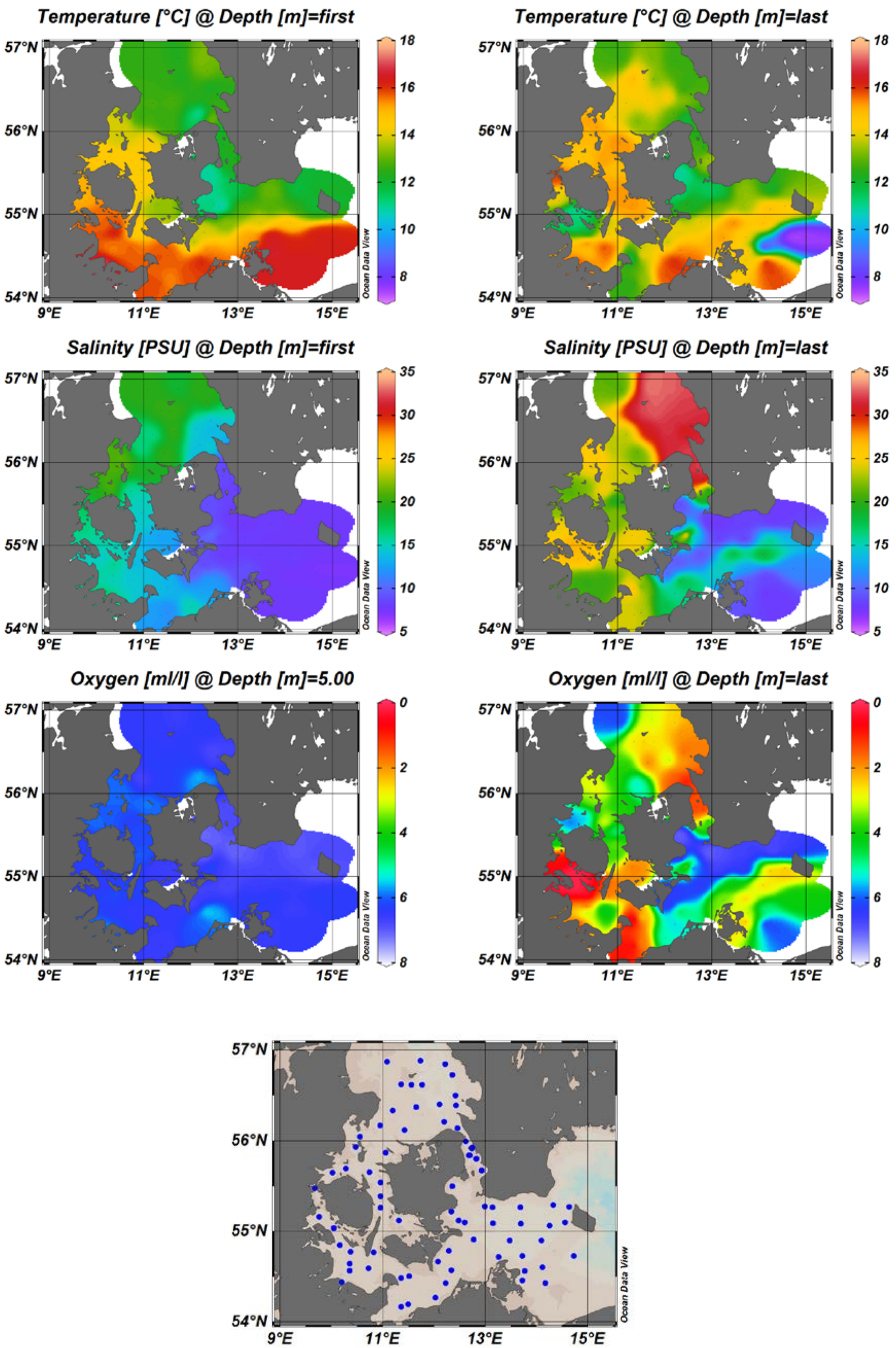


Figure 6: FRV "Solea" cruise 726/2016: Hydrography. CTD stations are depicted as blue dots in the area map (lower panel). Temperature (°C, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right). Surface oxygen concentration levels are displayed at 5 m depth.

Table 1: FRV "Solea", cruise 726/2016. Simrad EK80 calibration report.

Date:	30.09.2016		
Transceiver Type:	WBT		
Software Version:	EK80 1.8.3.0		
Reference Target:	Tungsten (WC-Co) 38.1 mm		
Transducer:	ES38B Serial No. 30545		
Frequency:	38000 Hz	Beamtype:	Split
Gain:	26.04 dB	Two Way Beam Angle:	-20.6 dB
Athw. Beam Angle:	6.91 deg	Along. Beam Angle:	7.35 deg
Athw. Offset Angle:	0.10 deg	Along. Offset Angle:	-0.21 deg
Depth:	4.20 m		
Pulse Duration:	1.024 ms		
Power:	1000 W		
TS Detection:			
Min. Value:	-53.0 dB	Min. Spacing:	0.0
Max. Gain Comp.:	3.0 dB	Min. Echolength:	0.8
		Max. Echolength:	1.8
Environment:			
Absorption Coeff.:	0.005372	Sound Velocity:	1494.38 m/s
Calibration results:			
Transducer Gain:	26.21 dB	SaCorrection:	0.33 dB
Athw. Beam Angle:	7.29 deg	Along. Beam Angle:	7.32 deg
Athw. Offset Angle:	-0.11 deg	Along. Offset Angle:	0.02 deg
Ts RMS-Error:	0.0399		

Table 2: FRV "Solea", cruise 726/2016. Catch composition (kg 0.5h^{-1}) by trawl haul in SD 21.

Haul No.	33	34	35	36	37	38	39	40	41	42	43	44	Total
Species / ICES Rectangle	41G2	42G2	42G2	42G1	42G1	42G1	41G2	41G1	41G1	41G0	41G1	41G2	
BELONE BELONE											0.02		0.02
CLUPEA HARENGUS	1.67	3.53	3.19	2.66	2.26	10.86	1.46	1.84	1.08		20.29	19.23	68.07
CRANGON CRANGON				+									+
CRYSTALLOGOBIUS LINEARIS	+	0.01		+		+		+				+	0.01
CTENOLABRUS RUPESTRIS						+							+
CYCLOPTERUS LUMPUS											0.160		0.16
ENGRAULIS ENCRASICOLUS	0.01	0.01	0.09	0.11	0.10	0.92	2.19	1.05	2.42	0.43	0.110	0.060	7.50
EUTRIGLA GURNARDUS	+	0.02	0.01	0.04	0.05				1.06	0.15		+	1.33
GADUS MORHUA		6.84	2.12				5.36	2.94	2.67			0.010	19.94
GASTEROSTEUS ACULEATUS	+					+		0.01	+	+	0.08	0.01	0.10
HIPPOGLOSSOIDES PLATESSOIDES					+								+
LEANDER				+									+
LIMANDA LIMANDA		0.81	0.09	0.11	0.07			0.1	1.05	0.2		0.01	2.44
LOLIGO FORBESI	0.01	0.01	0.06	0.12	0.05	0.73	0.05	+	0.02			0.37	1.42
MELANOGRAMMUS AEGLEFINUS	0.99												0.99
MERLANGIUS MERLANGUS	0.01	1.03	0.53	0.05	0.1	0.09	0.06	0.03	0.03	0.02	0.06	0.05	2.06
MERLUCCIUS MERLUCCIUS		0.18	0.27										0.45
MYSIDACEA				0.01									0.01
PLEURONECTES PLATESSA		0.95	0.41	0.49									1.85
POMATOSCHISTUS MINUTUS		+	+	+									+
SARDINA PILCHARDUS	0.01				0.06	0.01		0.03		0.06	0.25		0.42
SCOMBER SCOMBRUS					0.68	0.43	0.43						1.54
SEPIOLA			0.01	0.03		0.01							0.05
SPRATTUS SPRATTUS	0.13	4.8	3.66		11.93	8.05	0.34	0.12	0.16		4.82	0.29	34.30
SQUALUS ACANTHIAS		0.96											0.96
SYNGNATHUS ROSTELLATUS				+									+
TRACHINUS DRACO		0.23	0.21	0.19	2.28	3.39	0.39	0.67	0.38	0.14	0.34	0.22	8.44
TRACHURUS TRACHURUS	0.01	0.02	+				0.03	0.03	0.02	0.01	0.03	0.03	0.18
TRISOPTERUS ESMARKI			0.01	0.02									0.03
Total	**2.84**	**19.40**	**10.66**	**3.83**	**17.58**	**24.49**	**10.31**	**6.82**	**8.89**	**1.01**	**26.16**	**20.28**	**152.27**
Medusae	4.16	0.02	1.86	1.95	0.27	0.23	1.77	15.18	11.05	4.12	13.67	1.99	56.26

+ = < 0.01 kg

Table 3: FRV "Solea", cruise 726/2016. Catch composition (kg 0.5h^{-1}) by trawl haul in SD 22.

Haul No.	9	10	11	12	13	14	15	16	17	18	19	20	21
Species / ICES Rectangle	37G1	38G1	38G0	37G0	38G0	38G0	38G0	39G0	39F9	40G0	40G0	41G0	40G1
AGONUS CATAPHRACTUS							+						
ANGUILLA ANGUILLA									0.05				
CALLIONYMUS LYRA			0.03										
CLUPEA HARENGUS	1.54	2.08	2.72	4.20	3.48	0.17	0.37	0.28	0.08	0.26	0.04		0.13
CRANGON CRANGON											+		+
CRYSTALLOGOBIUS LINEARIS			+								+		+
CTENOLABRUS RUPESTRIS			+						+	0.01			0.01
CYCLOPTERUS LUMPUS						0.16	1.05						
ENGRAULIS ENCRASICOLUS	0.09	0.01	0.02	0.08	0.46	0.69	1.70	0.18	0.04	0.05	3.32	0.84	0.06
EUTRIGLA GURNARDUS													
GADUS MORHUA	0.19	0.01	5.01	9.44	0.04		0.02	0.01	0.02			0.08	0.01
GASTEROSTEUS ACULEATUS	0.01	0.01	0.01		0.09		0.15	0.19	0.51	0.01	+	0.02	0.02
GOBIUS			0.01										
GOBIUS NIGER			+						0.01		+		
LIMANDA LIMANDA	0.05	0.04	20.74	3.69	1.91		0.08		0.22		0.12	0.09	0.12
LOLIGO FORBESI											0.01	+	
LUMPENUS LAMPRETAEFORMIS			0.02										
MERLANGIUS MERLANGUS	0.24	0.01	0.93	0.22	0.06	0.01	0.04	0.10	0.04		0.06	0.06	0.03
MULLUS SURMULETUS			0.03								0.02	0.08	0.03
PHOLIS GUNNELLUS													
PLATICHTHYS FLESUS			2.43	0.22	0.50								
PLEURONECTES PLATESSA			2.90					0.15	0.10				
POMATOSCHISTUS MINUTUS	+		+	+							+		+
PSETTA MAXIMA									1.78				
SARDINA PILCHARDUS											0.01	0.01	0.02
SCOMBER SCOMBRUS						0.02						0.23	
SPINACHIA SPINACHIA				+									
SPRATTUS SPRATTUS	0.39	0.31	4.56	6.03	11.11	0.33	3.74	4.62	7.17	2.55		0.19	+
SYNGNATHUS ROSTELLATUS	+		+										
SYNGNATHUS TYPHLE		+					+			+	+	+	+
TRACHINUS DRACO	0.10		0.21	0.06							0.02	0.19	0.22
TRACHURUS TRACHURUS				0.04	0.03	0.03		+			0.01	0.12	0.05
TRISOPTERUS ESMARKI												+	+
TRISOPTERUS MINUTUS													
Total	**2.61**	**2.47**	**39.62**	**23.98**	**17.68**	**1.41**	**7.15**	**5.53**	**10.02**	**2.88**	**3.61**	**1.91**	**0.70**
Medusae	37.76	6.99	4.71	4.53	33.10	53.80	48.38	47.70	7.37	11.59	32.86	9.08	6.37

Haul No.	22	23	24	25	Total
Species / ICES Rectangle	40G0	39G0	39G0	39G1	
AGONUS CATAPHRACTUS			0.01		**0.01**
ANGUILLA ANGUILLA					**0.05**
CALLIONYMUS LYRA					**0.03**
CLUPEA HARENGUS	0.12	0.96	20.93	0.74	**38.10**
CRANGON CRANGON				+	+
CRYSTALLOGOBIUS LINEARIS	0.02	0.01		0.01	**0.04**
CTENOLABRUS RUPESTRIS	+		+		**0.02**
CYCLOPTERUS LUMPUS			0.21		**1.42**
ENGRAULIS ENCRASICOLUS	+	0.02	0.03		**7.59**
EUTRIGLA GURNARDUS			+		+
GADUS MORHUA			8.48	0.05	**23.36**
GASTEROSTEUS ACULEATUS	+	0.06	0.01	5.50	**6.59**
GOBIUS					**0.01**
GOBIUS NIGER				+	**0.01**
LIMANDA LIMANDA	0.03		0.21	0.01	**27.31**
LOLIGO FORBESI			0.01		**0.02**
LUMPENUS LAMPRETAEFORMIS					**0.02**
MERLANGIUS MERLANGUS	0.01	0.19	0.14	0.10	**2.24**
MULLUS SURMULETUS					**0.16**
PHOLIS GUNNELLUS				0.02	**0.02**
PLATICHTHYS FLESUS	0.18				**3.33**
PLEURONECTES PLATESSA			0.07		**3.22**
POMATOSCHISTUS MINUTUS	+	+		0.01	**0.01**
PSETTA MAXIMA					**1.78**
SARDINA PILCHARDUS				0.02	**0.06**
SCOMBER SCOMBRUS			0.05		**0.30**
SPINACHIA SPINACHIA					+
SPRATTUS SPRATTUS	0.31	1.19	50.12	5.55	**98.17**
SYNGNATHUS ROSTELLATUS					+
SYNGNATHUS TYPHLE	+	+		+	+
TRACHINUS DRACO		0.02			**0.82**
TRACHURUS TRACHURUS	+	0.11	0.16		**0.55**
TRISOPTERUS ESMARKI				+	+
TRISOPTERUS MINUTUS	+				+
Total	**0.67**	**2.56**	**80.43**	**12.01**	**215.24**
Medusae	8.31	23.15	8.46	2.78	**346.94**

+ = < 0.01 kg

Table 4: FRV "Solea", cruise 726/2016. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 23.

Haul No.	30	31	32	53	54	55	Total
Species / ICES Rectangle	40G2	40G2	41G2	40G2	40G2	41G2	
CARCINUS	0.03						**0.03**
CLUPEA HARENGUS	97.33	153.30		0.91	122.72	1.77	**376.03**
CRYSTALLOGOBIUS LINEARIS						+	+
ENGRAULIS ENCRASICOLUS			0.01	0.03		0.03	**0.07**
EUTRIGLA GURNARDUS	+		0.01				**0.01**
GADUS MORHUA	90.86	25.38	2.67	13.22	11.03		**143.16**
GASTEROSTEUS ACULEATUS	+	+	0.01	+	+	0.01	**0.02**
LIMANDA LIMANDA			0.36	0.25	0.06		**0.67**
LOLIGO FORBESI			0.01		+	0.05	**0.06**
MELANOGRAMMUS AEGLEFINUS				1.09	1.23		**2.32**
MERLANGIUS MERLANGUS	0.03		0.01		0.05	+	**0.09**
PLATICHTHYS FLESUS						0.35	**0.35**
PLEURONECTES PLATESSA	0.18				0.44		**0.62**
POLLACHIUS VIRENS	3.33			3.17			**6.50**
SARDINA PILCHARDUS					+		+
SPRATTUS SPRATTUS	0.13		0.01	0.07	0.32	0.28	**0.81**
SYNGNATHUS TYPHLE	+						+
TRACHINUS DRACO						0.02	**0.02**
TRACHURUS TRACHURUS			+			+	+
Total	**191.89**	**178.68**	**3.09**	**18.74**	**135.85**	**2.51**	**530.76**
Medusae	2.93	2.56	3.96	4.17	1.00	3.33	**17.96**

+ = < 0.01 kg

Table 5: FRV "Solea", cruise 726/2016. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 24.

Haul No.	1	2	3	4	5	6	7	8	26	27	28	29	45
Species / ICES Rectangle	37G2	38G2	38G3	38G3	38G4	38G3	37G3	38G4	38G2	38G2	38G3	38G4	39G2
AMMODYTES TOBIANUS							0.04						
BELONE BELONE			0.10							0.39			
CLUPEA HARENGUS	1.47	3.23	11.57	13.75	12.20	9.56	53.66	53.96	25.05	2.41	5.29	92.66	3.11
CRANGON CRANGON											+	+	+
CRYSTALLOGOBIUS LINEARIS	+	+								+			0.01
CTENOLABRUS RUPESTRIS	+												
CYCLOPTERUS LUMPUS		0.16	0.24									0.11	
ENGRAULIS ENCRASICOLUS	0.45	0.12							0.08	0.01	0.01		0.09
GADUS MORHUA	0.02	0.10		0.02		0.81	3.84	0.54	0.01	+	1.27	0.84	0.06
GASTEROSTEUS ACULEATUS	0.01	+		0.12			0.01		0.01	0.08	0.02	+	3.44
GOBIUS NIGER				0.01						0.01			+
LEANDER													+
LIMANDA LIMANDA	+	1.99	1.02							0.03			+
MERLANGIUS MERLANGUS	0.34	1.13	0.03	0.98			0.07	0.20	0.02	0.04	4.03	2.56	
MYOXOCEPHALUS SCORPIUS		0.03											
OSMERUS EPERLANUS							0.08						
PLATICHTHYS FLESUS		1.48	0.50	0.44	0.44	1.68	0.31		0.20	0.68	0.23		
PLEURONECTES PLATESSA		0.17		0.22						0.52	0.21	0.16	
POLLACHIUS POLLACHIUS													
POMATOSCHISTUS MINUTUS	+	+	+	0.01		0.01	0.01			0.04	+	+	+
SARDINA PILCHARDUS										0.01			+
SPRATTUS SPRATTUS	0.87	1.08	753.9	24.84	2.48	59.74	324.25	6.99	22.89	12.12	61.78	81.97	9.85
STIZOSTEDION LUCIOPERCA							0.26						
SYNGNATHUS TYPHLE	+												+
TRACHURUS TRACHURUS			0.01								+	0.02	
Total	**3.16**	**9.49**	**767.37**	**40.39**	**15.12**	**71.80**	**382.53**	**61.69**	**48.26**	**16.34**	**72.84**	**178.32**	**16.56**
Medusae	2.39	13.20	0.84	5.99	42.20	18.60	4.12	9.70	11.40	3.01	3.20	7.62	1.64

Haul No.	46	47	48	49	50	51	52	Total
Species / ICES Rectangle	39G3	39G3	39G4	39G4	39G3	39G3	39G2	
AMMODYTES TOBIANUS								**0.04**
BELONE BELONE								**0.49**
CLUPEA HARENGUS	0.93	1.80	4.16	2.67	5.24	1.26	0.95	**304.93**
CRANGON CRANGON								+
CRYSTALLOGOBIUS LINEARIS								**0.01**
CTENOLABRUS RUPESTRIS								+
CYCLOPTERUS LUMPUS							0.18	**0.69**
ENGRAULIS ENCRASICOLUS	0.01	0.19	0.04			0.02		**1.02**
GADUS MORHUA	0.01	0.36	3.78	1.35	2.45		0.36	**15.82**
GASTEROSTEUS ACULEATUS	0.24	0.01		+	+	+		**3.94**
GOBIUS NIGER								**0.02**
LEANDER								+
LIMANDA LIMANDA								**3.04**
MERLANGIUS MERLANGUS	+	0.25	3.61		2.20			**15.46**
MYOXOCEPHALUS SCORPIUS								**0.03**
OSMERUS EPERLANUS								**0.08**
PLATICHTHYS FLESUS	0.20		0.19	0.37	0.32			**7.04**
PLEURONECTES PLATESSA				0.23				**1.51**
POLLACHIUS POLLACHIUS					1.60			**1.60**
POMATOSCHISTUS MINUTUS	+	+	+		+			**0.07**
SARDINA PILCHARDUS								**0.01**
SPRATTUS SPRATTUS	2.25	126.52	12.71	2.22	85.84	4.72	1.22	**1598.24**
STIZOSTEDION LUCIOPERCA								**0.26**
SYNGNATHUS TYPHLE								+
TRACHURUS TRACHURUS	0.04	0.04	0.05		0.11	+		**0.27**
Total	**3.68**	**129.17**	**24.54**	**6.84**	**97.76**	**6.00**	**2.71**	**1954.57**
Medusae	5.54	1.50	5.25	5.20	3.24	23.29	15.96	**183.89**

+ = < 0.01 kg

Table 6: FRV "Solea", cruise 726/2016. Survey statistics by area.

Sub-division	ICES Rectangle	Area (nm²)	Sa (m²/NM²)	Sigma (cm²)	N total (million)	Herring (%)	Sprat (%)	NHerring (million)	NSprat (million)
21	41G0	108.1	319.5	1.254	275.42	0.00	0.00	0.00	0.00
21	41G1	946.8	59.5	2.032	277.24	45.42	12.30	125.92	34.10
21	41G2	432.3	132.9	1.752	327.93	69.33	5.97	227.35	19.58
21	42G1	884.2	56.5	1.680	297.36	49.97	44.64	148.60	132.75
21	42G2	606.8	91.3	1.557	355.82	44.02	48.70	156.64	173.30
21	**Total**	**2,978.2**			**1533.77**			**658.51**	**359.73**
22	37G0	209.9	198.0	1.100	377.82	30.53	65.12	115.35	246.03
22	37G1	723.3	104.2	1.290	584.25	46.44	25.42	271.33	148.54
22	38G0	735.3	192.3	0.805	1756.50	14.51	71.15	254.87	1249.83
22	38G1	173.2	191.5	1.166	284.46	74.65	20.49	212.36	58.27
22	39F9	159.3	194.7	0.460	674.25	0.49	88.39	3.34	595.94
22	39G0	201.7	143.0	0.905	318.71	19.59	70.64	62.44	225.12
22	39G1	250.0	110.0	0.341	806.45	1.16	20.78	9.38	167.58
22	40F9	51.3	25.6	1.102	11.92	7.35	87.86	0.88	10.47
22	40G0	538.1	96.4	1.102	470.72	7.35	87.86	34.59	413.57
22	40G1	174.5	511.7	0.830	1075.80	25.45	1.82	273.84	19.56
22	41G0	173.1	36.4	1.453	43.36	0.00	15.65	0.00	6.79
22	**Total**	**3,389.7**			**6404.24**			**1238.38**	**3141.70**
23	39G2	130.9	208.6	0.580	470.79	4.44	38.88	20.90	183.02
23	40G2	164.0	825.0	4.530	298.68	97.12	0.64	290.08	1.91
23	41G2	72.3	123.6	1.068	83.67	70.03	25.78	58.60	21.57
23	**Total**	**367.2**			**853.14**			**369.58**	**206.50**
24	37G2	192.4	97.8	1.325	142.01	34.52	36.01	49.03	51.14
24	37G3	167.7	3085.4	0.687	7531.61	2.00	97.96	150.31	7377.79
24	37G4	875.1	186.5	2.984	546.94	64.76	35.03	354.20	191.60
24	38G2	832.9	322.7	1.239	2169.30	25.16	64.24	545.88	1393.56
24	38G3	865.7	1440.8	1.179	10579.31	4.33	94.96	457.78	10046.07
24	38G4	1034.8	441.8	2.832	1614.32	48.15	51.61	777.34	833.14
24	39G2	406.1	275.4	0.580	1928.27	4.44	38.88	85.62	749.64
24	39G3	765.0	348.1	1.426	1867.44	5.09	87.99	95.05	1643.12
24	39G4	524.8	349.9	2.455	747.97	19.15	77.19	143.26	577.35
24	**Total**	**5,664.5**			**27,127.17**			**2658.47**	**22863.41**
22-24	**Total**	**9,421.4**			**34,384.55**			**4266.43**	**26211.61**
21-24	**Total**	**12,399.6**			**35,918.32**			**4924.94**	**26571.34**

Table 7: FRV "Solea", cruise 726/2016. Numbers (millions) of herring incl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0										0.00
21	41G1	94.95	27.44	2.68	0.57	0.14	0.13				125.91
21	41G2	220.63	5.85	0.77	0.07	0.03					227.35
21	42G1	132.14	15.52	0.69	0.06	0.08	0.10				148.59
21	42G2	154.58	1.97	0.07		0.01	0.01				156.64
21	Total	602.30	50.78	4.21	0.70	0.26	0.24	0.00	0.00	0.00	658.49
22	37G0	107.26	3.94	1.50	0.82	0.97	0.52	0.16	0.19		115.36
22	37G1	234.10	17.42	5.89	1.98	7.39	3.04	0.87	0.66		271.35
22	38G0	238.58	6.72	4.46	1.09	2.03	0.78	0.38	0.12	0.71	254.87
22	38G1	211.70	0.66								212.36
22	39F9	3.34									3.34
22	39G0	61.55	0.64	0.02	0.03	0.15	0.02	0.03			62.44
22	39G1	9.26	0.09			0.02	0.01				9.38
22	40F9	0.77	0.05	0.02	0.03	0.01					0.88
22	40G0	30.08	1.91	0.89	1.03	0.55		0.14			34.60
22	40G1	273.84									273.84
22	41G0										0.00
22	Total	1,170.48	31.43	12.78	4.98	11.12	4.37	1.58	0.97	0.71	1,238.42
23	39G2	16.12	1.19	0.67	0.91	1.35	0.46	0.07	0.11	0.01	20.89
23	40G2	7.76	189.69	55.82	25.32	8.58	2.15	0.56	0.2		290.08
23	41G2	58.31	0.29								58.60
23	Total	82.19	191.17	56.49	26.23	9.93	2.61	0.63	0.31	0.01	369.57
24	37G2	43.11	1.70	1.02	0.68	1.73	0.73	0.02	0.02		49.01
24	37G3	60.72	15.67	13.37	19.09	24.25	10.56	3.62	2.07	0.96	150.31
24	37G4	5.89	55.73	50.52	81.09	93.23	37.75	17.08	9.95	2.97	354.21
24	38G2	367.32	48.05	30.93	33.09	46.02	15.02	2.74	2.48	0.24	545.89
24	38G3	246.67	42.97	31.87	44.48	57.35	21.97	6.19	4.94	1.34	457.78
24	38G4	23.63	94.91	99.65	207.82	185.26	87.83	45.37	23.83	9.04	777.34
24	39G2	66.04	4.89	2.75	3.74	5.53	1.87	0.29	0.45	0.06	85.62
24	39G3	26.14	14.71	10.06	13.78	18.66	7.48	2.11	1.70	0.41	95.05
24	39G4	10.49	18.94	18.59	32.03	35.97	15.08	6.12	4.10	1.95	143.27
24	Total	850.01	297.57	258.76	435.80	468.00	198.29	83.54	49.54	16.97	2,658.48
22-24	Total	2,102.68	520.17	328.03	467.01	489.05	205.27	85.75	50.82	17.69	4,266.47
21-24	Total	2,704.98	570.95	332.24	467.71	489.31	205.51	85.75	50.82	17.69	4,924.96

Table 8: FRV "Solea", cruise 726/2016. Mean weight (g) of herring incl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0										
21	41G1	14.18	40.93	55.33	54.39	31.85	45.82				21.12
21	41G2	13.18	39.69	60.19	53.48	31.85					14.04
21	42G1	14.83	38.26	40.30	49.00	31.85	45.82				17.44
21	42G2	8.94	37.74	43.82		31.85	45.82				9.32
21	Total	12.61	39.85	53.56	53.84	31.85	45.82				15.04
22	37G0	5.86	32.57	47.70	52.02	39.10	46.97	46.39	46.00		8.23
22	37G1	6.94	33.97	43.40	35.37	38.20	42.08	41.44	46.00		11.12
22	38G0	5.25	33.86	62.49	45.39	51.92	46.85	48.11	46.00	60.00	7.91
22	38G1	9.52	21.33								9.56
22	39F9	4.93									4.93
22	39G0	7.26	32.08	27.87	30.80	34.67	31.38	36.82			7.62
22	39G1	8.92	31.38			31.37	31.37				9.21
22	40F9	7.56	32.82	52.66	49.48	34.82		36.82			11.76
22	40G0	7.56	32.82	52.66	49.48	34.82		36.82			11.91
22	40G1	9.32									9.32
22	41G0										0.00
22	Total	7.56	33.39	51.20	43.28	40.55	43.44	43.05	46.00	60.00	9.34
23	39G2	9.48	32.70	34.88	40.33	36.71	39.30	49.63	45.23	45.98	15.72
23	40G2	9.94	42.63	70.05	92.15	79.86	115.41	107.38	139.40		53.19
23	41G2	8.88	29.33								8.98
23	Total	9.10	42.55	69.63	90.35	73.99	102.00	100.96	105.98	45.98	44.06
24	37G2	10.17	31.38	26.51	36.28	34.23	36.28	50.30	50.30		12.88
24	37G3	9.01	33.52	43.74	49.42	43.06	46.55	57.94	56.47	54.76	30.04
24	37G4	21.01	33.38	46.62	56.99	46.65	54.41	76.64	57.32	65.76	49.23
24	38G2	9.67	30.76	29.83	33.38	34.66	37.94	49.73	46.61	45.98	17.38
24	38G3	7.81	32.53	38.96	46.95	41.26	45.14	61.34	52.12	62.05	23.44
24	38G4	16.79	33.49	53.10	76.82	55.34	68.43	84.40	70.75	73.82	60.82
24	39G2	9.48	32.70	34.88	40.33	36.71	39.30	49.63	45.23	45.98	15.73
24	39G3	11.74	32.71	38.59	43.31	40.40	45.32	59.64	52.50	67.46	32.71
24	39G4	12.25	33.82	50.34	58.02	46.20	51.30	64.07	59.39	68.61	47.24
24	Total	9.47	32.85	45.77	62.77	47.62	57.14	76.58	62.58	69.16	38.11
22-24	Total	8.39	36.45	50.09	64.11	47.99	57.42	76.14	62.53	68.78	30.27
21-24	Total	9.33	36.75	50.13	64.09	47.98	57.40	76.14	62.53	68.78	28.23

Table 9: FRV "Solea", cruise 726/2016. Total biomass (t) of herring incl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0										0.0
21	41G1	1,346.4	1,123.1	148.3	31.0	4.5	6.0				2,659.2
21	41G2	2,907.9	232.2	46.4	3.7	1.0					3,191.1
21	42G1	1,959.6	593.8	27.8	2.9	2.6	4.6				2,591.3
21	42G2	1,382.0	74.4	3.1		0.3	0.5				1,460.2
21	Total	7,595.9	2,023.5	225.5	37.7	8.3	11.0	0.0	0.0	0.0	9,901.8
22	37G0	628.5	128.3	71.6	42.7	37.9	24.4	7.4	8.7		949.6
22	37G1	1,624.7	591.8	255.6	70.0	282.3	127.9	36.1	30.4		3,018.7
22	38G0	1,252.6	227.5	278.7	49.5	105.4	36.5	18.3	5.5	42.6	2,016.6
22	38G1	2,015.4	14.1								2,029.5
22	39F9	16.5									16.5
22	39G0	446.9	20.5	0.6	0.9	5.2	0.6	1.1			475.8
22	39G1	82.6	2.8			0.6	0.3				86.4
22	40F9	5.8	1.6	1.1	1.5	0.4					10.3
22	40G0	227.4	62.7	46.9	51.0	19.2		5.2			412.2
22	40G1	2,552.2									2,552.2
22	41G0										0.0
22	Total	8,852.5	1,049.4	654.4	215.53	451.0	189.8	68.00	44.62	42.6	11,567.7
23	39G2	152.8	38.9	23.4	36.70	49.6	18.1	3.47	4.98	0.5	328.4
23	40G2	77.1	8,086.5	3,910.2	2,333.2	685.2	248.1	60.1	27.9		15,428.4
23	41G2	517.8	8.5								526.3
23	Total	747.7	8,133.9	3,933.6	2,369.9	734.8	266.2	63.6	32.9	0.5	16,283.0
24	37G2	438.4	53.4	27.0	24.7	59.2	26.5	1.0	1.0		631.2
24	37G3	547.1	525.3	584.8	943.4	1,044.2	491.6	209.7	116.9	52.6	4,515.6
24	37G4	123.8	1,860.3	2,355.2	4,621.3	4,349.2	2,054.0	1,309.0	570.3	195.3	17,438.4
24	38G2	3,552.0	1,478.0	922.6	1,104.5	1,595.1	569.9	136.3	115.6	11.0	9,485.0
24	38G3	1,926.5	1,397.8	1,241.7	2,088.3	2,366.3	991.7	379.7	257.5	83.2	10,732.6
24	38G4	396.8	3,178.5	5,291.4	15,964.7	10,252.3	6,010.2	3,829.2	1,686.0	667.3	47,276.5
24	39G2	626.1	159.9	95.9	150.8	203.0	73.5	14.4	20.4	2.8	1,346.7
24	39G3	306.9	481.2	388.2	596.8	753.9	339.0	125.8	89.3	27.7	3,108.7
24	39G4	128.5	640.6	935.8	1,858.4	1,661.8	773.6	392.1	243.5	133.8	6,768.1
24	Total	8,045.9	9,774.9	11,842.8	27,353.1	22,284.9	11,329.9	6,397.3	3,100.4	1,173.6	101,302.7
22-24	Total	17,646.1	18,958.2	16,430.7	29,938.5	23,470.6	11,785.9	6,528.9	3,177.8	1,216.7	129,153.4
21-24	Total	25,242.0	20,981.6	16,656.2	29,976.2	23,478.9	11,796.9	6,528.9	3,177.8	1,216.7	139,055.2

Table 10: FRV "Solea", cruise 726/2016. Numbers (millions) of sprat by age and area.

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0										0.00
21	41G1		7.53	22.27	3.81	0.49					34.10
21	41G2	3.61	11.42	4.31	0.24	0.01					19.59
21	42G1	0.26	52.84	72.75	6.48	0.42					132.75
21	42G2	9.21	134.66	28.38	1.02	0.02					173.29
21	Total	13.08	206.45	127.71	11.55	0.94	0.00	0.00	0.00	0.00	359.73
22	37G0	230.74	4.00	10.46	0.81		0.02				246.03
22	37G1	145.48	1.14	1.53	0.32		0.06				148.53
22	38G0	1,225.07	3.05	17.80	3.41	0.44	0.06				1,249.83
22	38G1	58.00	0.27								58.27
22	39F9	595.94									595.94
22	39G0	168.95	7.73	40.34	4.59	2.68	0.84				225.13
22	39G1	166.61	0.35	0.62							167.58
22	40F9	3.63	1.32	4.98	0.48	0.04	0.01				10.46
22	40G0	143.51	52.14	196.88	19.12	1.58	0.34				413.57
22	40G1	19.56									19.56
22	41G0	1.78	1.08	3.45	0.47						6.78
22	Total	2,759.27	71.08	276.06	29.20	4.74	1.33	0.00	0.00	0.00	3,141.68
23	39G2	166.28	9.03	6.13	0.73	0.33	0.28	0.24			183.02
23	40G2	0.75	0.11	0.49	0.10	0.24	0.21				1.90
23	41G2	21.08	0.23	0.16	0.03	0.06					21.56
23	Total	188.11	9.37	6.78	0.86	0.63	0.49	0.24	0.00	0.00	206.48
24	37G2	38.88	4.26	5.65	1.22	0.41	0.57	0.14			51.13
24	37G3	7,292.75	70.05	14.99							7,377.79
24	37G4	35.21	23.69	69.54	31.13	16.47	12.71	2.84			191.59
24	38G2	1,031.84	173.54	148.43	21.05	6.19	8.80	3.70			1,393.55
24	38G3	5,186.01	2,295.86	1,977.42	298.01	110.41	118.30	60.06			10,046.07
24	38G4	104.02	168.00	326.96	115.08	58.13	47.60	13.35			833.14
24	39G2	681.08	36.99	25.09	2.99	1.33	1.16	0.99			749.63
24	39G3	433.93	467.38	544.18	99.31	36.20	41.70	20.42			1,643.12
24	39G4	29.11	160.23	254.76	64.47	30.76	28.74	9.28			577.35
24	Total	14,832.83	3,400.00	3,367.02	633.26	259.90	259.58	110.78	0.00	0.00	22,863.37
22-24	Total	17,780.21	3,480.45	3,649.86	663.32	265.27	261.40	111.02	0.00	0.00	26,211.53
21-24	Total	17,793.29	3,686.90	3,777.57	674.87	266.21	261.40	111.02	0.00	0.00	26,571.26

Table 11: FRV “Solea”, cruise 726/2016. Mean weight (g) of sprat by age and area.

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0										
21	41G1	0.00	12.56	16.15	18.11	18.66					15.62
21	41G2	3.05	10.84	13.75	15.43	18.07					10.11
21	42G1	8.52	11.93	15.14	17.50	18.68					13.97
21	42G2	3.38	10.34	12.74	14.28	18.07					10.39
21	Total	3.39	10.86	14.74	17.37	18.65					12.19
22	37G0	4.96	10.07	13.24	13.61		15.94				5.43
22	37G1	4.92	7.73	15.94	15.94		15.94				5.08
22	38G0	3.49	10.48	13.86	15.28	19.50	15.94				3.69
22	38G1	5.14	7.24								5.15
22	39F9	2.26									2.26
22	39G0	3.34	11.84	13.69	14.40	17.82	18.50				5.94
22	39G1	3.80	9.72	13.27							3.85
22	40F9	3.12	11.90	12.85	13.13	17.49	15.94				9.39
22	40G0	3.12	11.90	12.85	13.13	17.49	15.94				9.39
22	40G1	4.45									4.45
22	41G0	4.26	11.13	12.38	12.46						10.05
22	Total	3.45	11.62	13.06	13.61	17.86	17.56				4.61
23	39G2	5.09	12.46	13.87	15.51	15.28	16.29	14.18			5.84
23	40G2	5.01	15	15.99	16.23	20.87	27.5				13.55
23	41G2	3.52	7.97	13.78	13.78	13.78					3.69
23	Total	4.91	12.38	14.02	15.53	17.27	21.09	14.18			5.69
24	37G2	4.56	13.58	14.92	16.24	17.52	16.47	16.17			7.00
24	37G3	3.71	9.87	10.31							3.78
24	37G4	4.85	13.97	16.10	17.75	18.69	17.85	18.29			14.41
24	38G2	4.68	12.78	14.25	15.37	14.79	15.57	13.69			7.00
24	38G3	4.41	12.88	14.28	15.58	15.17	15.89	13.92			8.93
24	38G4	4.88	13.67	15.58	17.49	18.45	17.61	17.07			14.46
24	39G2	5.09	12.46	13.87	15.51	15.28	16.29	14.18			5.84
24	39G3	5.20	13.35	14.68	16.13	16.32	16.20	15.41			11.97
24	39G4	5.30	13.62	15.13	16.94	18.16	17.13	15.65			14.69
24	Total	4.15	12.96	14.55	16.25	16.64	16.48	14.83			7.66
22-24	Total	4.05	12.93	14.44	16.14	16.66	16.49	14.83			7.28
21-24	Total	4.04	12.81	14.45	16.16	16.67	16.49	14.83			7.34

Table 12: FRV “Solea”, cruise 726/2016. Total biomass (t) of sprat by age and area.

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0										0.0
21	41G1	0.0	94.6	359.8	69.1	9.1					532.5
21	41G2	11.0	123.8	59.2	3.7	0.3					197.9
21	42G1	2.2	630.4	1,101.2	113.3	7.9					1,855.0
21	42G2	31.1	1,392.2	361.5	14.6	0.4					1,799.8
21	Total	44.3	2,241.0	1,881.6	200.7	17.6	0.0	0.0	0.0	0.0	4,385.2
22	37G0	1,145.6	40.3	138.5	11.0		0.4				1,335.7
22	37G1	715.9	8.8	24.4	5.1		1.0				755.3
22	38G0	4,270.6	31.9	246.6	52.2	8.7	0.9				4,610.9
22	38G1	298.4	2.0								300.3
22	39F9	1,345.8									1,345.8
22	39G0	564.3	91.5	552.1	66.1	47.7	15.5				1,337.1
22	39G1	633.9	3.4	8.2							645.5
22	40F9	11.3	15.7	64.0	6.4	0.7	0.1				98.3
22	40G0	447.3	620.6	2,529.8	251.1	27.6	5.4				3,881.8
22	40G1	87.0									87.0
22	41G0	7.6	12.1	42.7	5.9						68.3
22	Total	9,527.5	826.3	3,606.4	397.7	84.7	23.3	0.0	0.0	0.0	14,465.9
23	39G2	846.5	112.5	85.0	11.3	5.0	4.6	3.4			1,068.3
23	40G2	3.8	1.7	7.9	1.6	5.1	5.8				25.9
23	41G2	74.3	1.8	2.2	0.5	0.9					79.7
23	Total	924.5	116.0	95.1	13.4	11.0	10.5	3.4	0.0	0.0	1,173.9
24	37G2	177.2	57.9	84.4	19.8	7.2	9.4	2.2			358.1
24	37G3	27,042.2	691.7	154.4							27,888.3
24	37G4	170.7	330.8	1,119.7	552.6	307.9	226.9	52.0			2,760.5
24	38G2	4,824.1	2,217.2	2,115.4	323.5	91.5	137.1	50.7			9,759.4
24	38G3	22,877.5	29,575.6	28,246.1	4,643.0	1,675.1	1,879.6	835.9			89,732.7
24	38G4	507.3	2,297.0	5,093.4	2,013.2	1,072.5	838.2	227.9			12,049.4
24	39G2	3,467.1	460.9	348.1	46.3	20.3	18.9	14.1			4,375.6
24	39G3	2,256.4	6,239.3	7,988.0	1,602.2	590.8	675.4	314.7			19,666.6
24	39G4	154.2	2,182.5	3,854.6	1,092.2	558.7	492.3	145.2			8,479.7
24	Total	61,476.7	44,052.9	49,003.9	10,292.6	4,323.9	4,277.7	1,642.6	0.0	0.0	175,070.4
22-24	Total	71,928.8	44,995.2	52,705.4	10,703.7	4,419.5	4,311.5	1,646.1	0.0	0.0	190,710.1
21-24	Total	71,973.1	47,236.1	54,587.0	10,904.4	4,437.2	4,311.5	1,646.1	0.0	0.0	195,095.3

Table 13: **FRV "Solea", cruise 726/2016. Numbers (m) of herring excl. CBH by age/W-rings and area.**

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0										0.00	
21	41G1	94.95	27.44	2.68	0.57	0.14	0.13				125.91	
21	41G2	220.63	5.85	0.77	0.07	0.03					227.35	
21	42G1	132.14	15.52	0.69	0.06	0.08	0.10				148.59	
21	42G2	154.58	1.97	0.07		0.01	0.01				156.64	
21	Total	602.30	50.78	4.21	0.70	0.26	0.24	0.00	0.00	0.00	658.49	
22	37G0	107.25	3.69	1.19	0.38						112.51	
22	37G1	234.10	17.42	2.97							254.48	
22	38G0	238.51	6.74	4.15		0.71					250.12	
22	38G1	211.69									211.69	
22	39F9	3.34									3.34	
22	39G0	61.55	0.59								62.14	excl. CBH
22	39G1	9.26	0.09								9.36	
22	40F9	0.77	0.05	0.02							0.83	
22	40G0	30.08	1.91	0.75							32.74	
22	40G1	273.84									273.84	
22	41G0										0.00	
22	Total	1,170.39	30.50	9.09	0.38	0.71	0.00	0.00	0.00	0.00	1,211.06	
23	39G2	16.12	1.17	0.14	0.16						17.59	excl. CBH
23	40G2	7.76	189.69	55.82	25.32	8.58	2.15	0.56	0.2		290.08	
23	41G2	58.31	0.29								58.60	
23	Total	82.19	191.15	55.96	25.48	8.58	2.15	0.56	0.20	0.00	366.27	
24	37G2	43.11	1.45	0.02							44.58	
24	37G3	60.72	15.45	7.00	7.31	1.24	0.42	0.14			92.28	
24	37G4	5.89	54.55	25.83	39.23	12.20	4.21	2.90	0.18		144.99	
24	38G2	367.32	46.76	2.39	1.88						418.35	
24	38G3	246.67	42.01	10.53	13.43	3.23	0.79	0.46			317.12	excl. CBH
24	38G4	23.63	92.93	57.80	134.41	42.43	25.58	13.38	2.98		393.14	
24	39G2	66.04	4.80	0.59	0.65						72.08	
24	39G3	26.14	14.65	3.29	2.95	0.50	0.31	0.10			47.94	
24	39G4	10.49	18.34	11.54	16.18	5.24	1.42	0.48	0.12		63.81	
24	Total	850.01	290.94	118.99	216.04	64.84	32.73	17.46	3.28	0.00	1,594.29	
22-24	Total	2,102.59	512.59	184.04	241.90	74.13	34.88	18.02	3.48	0.00	3,171.62	
21-24	Total	2,704.89	563.37	188.25	242.60	74.39	35.12	18.02	3.48	0.00	3,830.11	

Table 14: **FRV "Solea", cruise 726/2016. Mean weight (g) of herring excl. CBH by age/W-rings and area.**

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0											
21	41G1	14.18	40.93	55.33	54.39	31.85	45.82				21.12	
21	41G2	13.18	39.69	60.19	53.48	31.85					14.04	
21	42G1	14.83	38.26	40.30	49.00	31.85	45.82				17.44	
21	42G2	8.94	37.74	43.82		31.85	45.82				9.32	
21	Total	12.61	39.85	53.56	53.84	31.85	45.82				15.04	
22	37G0	5.72	33.09	51.22	64.00						7.30	
22	37G1	6.73	33.85	49.51							9.08	
22	38G0	5.11	33.79	66.19		80.00					7.11	
22	38G1	9.16									9.16	
22	39F9	4.74									4.74	
22	39G0	7.01	32.69								7.25	excl. CBH
22	39G1	8.59	30.83								8.81	
22	40F9	7.28	32.93	63.00							10.06	
22	40G0	7.28	32.93	63.00							10.06	
22	40G1	8.93									8.93	
22	41G0											
22	Total	7.30	33.65	58.50	64.00	80.00					8.41	
23	39G2	9.17	32.99	56.41	62.82						11.62	excl. CBH
23	40G2	9.94	42.63	70.05	92.15	79.86	115.41	107.38	139.40		53.19	
23	41G2	8.88	29.33								8.98	
23	Total	9.04	42.55	70.02	91.97	79.86	115.41	107.38	139.40		44.12	
24	37G2	9.95	33.54	48.00							12.88	
24	37G3	8.89	34.24	60.37	69.21	80.98	88.62	87.80			30.04	
24	37G4	20.42	34.20	65.23	78.33	86.53	119.52	138.94	136.25		49.23	
24	38G2	9.42	31.03	53.93	69.05						17.38	
24	38G3	7.63	33.15	61.35	73.66	85.78	96.09	103.39			23.44	excl. CBH
24	38G4	16.39	34.36	71.71	97.14	102.97	114.02	116.70	136.25		60.82	
24	39G2	9.17	32.99	56.41	62.82						15.73	
24	39G3	11.50	33.15	60.74	71.99	88.62	88.74	87.80			32.71	
24	39G4	11.95	34.93	64.99	76.26	79.70	97.18	94.82	136.25		47.24	
24	Total	9.24	33.56	67.33	89.06	96.61	113.00	119.04	136.25		34.38	
22-24	Total	8.15	36.92	67.71	89.33	94.51	113.15	118.68	136.43		26.39	
21-24	Total	9.14	37.18	67.39	89.23	94.29	112.69	118.68	136.43		24.44	

Table 15: FRV "Solea", cruise 726/2016. Total biomass (t) of herring excl. CBH and mature herring by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0										0.0	
21	41G1	1,346.4	1,123.1	148.3	31.0	4.5	6.0				2,659.2	
21	41G2	2,907.9	232.2	46.4	3.7	1.0					3,191.1	
21	42G1	1,959.6	593.8	27.8	2.9	2.6	4.6				2,591.3	
21	42G2	1,382.0	74.4	3.1		0.3	0.5				1,460.2	
21	Total	7,595.9	2,023.5	225.5	37.7	8.3	11.0	0.0	0.0	0.0	9,901.8	
22	37G0	613.8	122.0	61.1	24.4						821.2	
22	37G1	1,575.0	589.6	147.1							2,311.7	
22	38G0	1,219.7	227.8	274.9		57.1					1,779.5	
22	38G1	1,939.1									1,939.1	
22	39F9	15.8									15.8	
22	39G0	431.2	19.4								450.5	excl. CBH
22	39G1	79.5	2.9								82.4	
22	40F9	5.6	1.6	1.2							8.4	
22	40G0	219.0	63.0	47.4							329.4	
22	40G1	2,445.1									2,445.1	
22	41G0										0.0	
22	Total	8,543.8	1,026.3	531.6	24.4	57.1	0.0	0.00	0.00	0.0	10,183.1	
23	39G2	147.8	38.6	7.9	10.1						204.4	excl. CBH
23	40G2	77.1	8,086.5	3,910.2	2,333.2	685.2	248.1	60.1	27.9		15,428.4	
23	41G2	517.8	8.5								526.3	
23	Total	742.7	8,133.6	3,918.1	2,343.3	685.2	248.1	60.1	27.9	0.0	16,159.1	
24	37G2	428.9	48.6	1.0							478.5	
24	37G3	539.8	529.0	422.6	505.9	100.4	37.2	12.3			2,147.3	
24	37G4	120.3	1,865.6	1,684.9	3,072.9	1,055.7	503.2	402.9	24.5		8,730.0	
24	38G2	3,460.2	1,451.0	128.9	129.8						5,169.8	
24	38G3	1,882.1	1,392.6	646.0	989.3	277.1	75.9	47.6			5,310.5	excl. CBH
24	38G4	387.3	3,193.1	4,144.8	13,056.6	4,369.0	2,916.6	1,561.5	406.0		30,034.9	
24	39G2	605.6	158.4	33.3	40.8						838.1	
24	39G3	300.6	485.7	199.8	212.4	44.3	27.5	8.8			1,279.1	
24	39G4	125.4	640.6	750.0	1,233.9	417.6	138.0	45.5	16.4		3,367.3	
24	Total	7,850.1	9,764.5	8,011.3	19,241.6	6,264.1	3,698.5	2,078.5	446.9	0.0	57,355.5	
22-24	Total	17,136.6	18,924.4	12,461.0	21,609.2	7,006.4	3,946.6	2,138.7	474.8	0.0	83,697.7	
21-24	Total	24,732.5	20,947.9	12,686.5	21,646.9	7,014.7	3,957.6	2,138.7	474.8	0.0	93,599.5	

Annex 5b: Irish Sea Acoustic Survey (ISAS)

SURVEY SUMMARY TABLE	
Name of the survey (abbreviation):	ISAS
Summary:	
The vessel departed Belfast at 2200 on the 27th August and proceeded to the east coast of the Isle of Man for acoustic calibration off Laxey on the 28th August. The survey started on the peripheral Irish Sea transects to the west of the Solway Firth at 1215 on the 29th August and continued to the completion of transect 102 to the northeast of Angelsey on the 1st September before returning to Belfast for maintenance and staff change. An additional calibration check was conducted on the 31st August. The survey recommenced on 9th September and concluded on the 17th September during which, the remaining peripheral Irish Sea transects and a further set of transects around the Isle of Man were completed. Additional survey transects in the vicinity of Rig Bank were conducted on 13th September. Sea conditions were reasonably good during the survey; one particularly poor weather day on the 12th September resulted in a temporary cessation of the survey. The herring were fairly widely distributed within mixed schools at low abundance, with a few distinct high abundance areas. The largest herring aggregations were found northeast of the Isle of Man and off the Northern Ireland coast.	
	Description
Survey design	The survey design of systematic, parallel transects covers approximately 620 nm. The position of the set of widely-spaced (8-10 nm) transects around the periphery of the Irish Sea is randomized within +/- 4 nm of a baseline position each year and transect spacing is reduced to 2 nm in strata around the Isle of Man to improve precision of estimates of adult herring biomass. Survey design and methodology adheres to the methods laid out in the WGIPS acoustic survey manual.
Index Calculation method	Weighted mean TS is applied to the NASC value to give numbers per square nautical mile – further decomposed by age class according to length frequencies in relevant target identified trawls and survey age-length key.
Random/systematic error issues	NA
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	NA, Sea conditions were reasonably good during the survey; one particularly poor weather day on the 12th September resulted in a temporary cessation of the survey to ward against this.
Extinction (shadowing)	NA
Blind zone	NA
Dead zone	NA
Allocation of backscatter to species	Directed trawling, with 31 successful trawls completed during the course of this survey.
Target strength	Herring, sprat and horse mackerel: TS = 20log(L) -71.2 db Mackerel: TS = 20log(L) -84.9 db Gadoids: TS = 20log(L) -67.5 db

Calibration	The hull mounted Simrad EK60 acoustic system with 38 kHz split-beam was calibrated on the 28th August off Laxey on the east coast of the Isle of Man. Conditions were good and the calibration results satisfactory. All procedures were according to those defined in the survey manual.

Survey report for RV Corystes

27th August – 17th September 2015

Pieter-Jan Schön and Gavin Mcneill Agri-Food and Biosciences Institute (AFBI),

Belfast, Northern Ireland

1. INTRODUCTION

Acoustic surveys of the northern Irish Sea (ICES Area VIIaN) have been carried by the Agri-Food and Biosciences Institute (AFBI), formerly the Department of Agriculture and Rural Development for Northern Ireland (DARD), since 1991. This report covers the routine Irish Sea survey in the autumn.

2. SURVEY DESCRIPTION & METHODS

2.1 Personnel

Pieter-Jan Schön (SIC)
Mathieu Lundy
Gavin McNeill
Peter McCorriston
Ian McCausland
Enda O'Callaghan
Jim McArdle
Sarah Simpson
Suzanne Beck
Cathy Hinds

2.2 Narrative

The vessel departed Belfast at 2200 on the 27th August and proceeded to the east coast of the Isle of Man for acoustic calibration off Laxey on the 28th August. The survey started on the peripheral Irish Sea transects to the west of the Solway Firth at 1215 on the 29th August and continued to the completion of transect 102 to the northeast of Anglsey on the 1st September before returning to Belfast for maintenance and staff change. An additional calibration check was conducted on the 31st August.

The survey recommenced on 9th September and concluded on the 17th September during which, the remaining peripheral Irish Sea transects and a further set of transects around the Isle of Man were completed. Additional survey transects in the vicinity of Rig Bank were conducted on 13th September. Sea conditions were reasonably good during the survey, one perticulary poor weather day on the 12th September resulted in a temporary cessation of the survey.

Survey design

The survey design of systematic, parallel transects covers approximately 620 nm (Figure 5B.1). The position of the set of widely-spaced (8-10 nm) transects around the periphery of the Irish Sea is randomized within +/- 4 nm of a baseline position each year. Transect spacing is reduced to 2 nm in strata around the Isle of Man to improve precision of estimates of adult herring biomass. Relatively lower effort is deployed around the periphery of the Irish Sea where the acoustic targets comprise mainly extended school groups of sprats and 0-group herring. Although this survey design yields high-precision estimates for these small clupeoids due to their extended distribution, the probability of encountering highly aggregated and patchy schools of larger herring remains low around the periphery of the Irish Sea compared with around the Isle of Man. Survey design and methodology adheres to the methods laid out in the WGIPS acoustic survey manual.

2.4 Calibration

The hull mounted Simrad EK60 acoustic system with 38 kHz split-beam was calibrated on the 28th August off Laxey on the east coast of the Isle of Man. Conditions were good and the calibration results satisfactory. All procedures were according to those defined in the survey manual. Summary of calibration results are presented in Table 5B.1.

2.5 Acoustic data collection

Acoustic data were only collected during 24hrs a day, except in coastal areas on the English and Irish coasts were data collection was restricted to daylight hours (0600-2100). Acoustic data at 38 kHz are collected in 15-minute elementary distance sampling units (EDSU's) with the vessel steaming at 10 knots. A Simrad EK-60 echosounder with hull-mounted split-beam transducer is employed, and data are logged and analysed using SonarData Echoview software. The system settings are given in Table 5B.1.

2.6 Biological data – fishing stations

Targets are identified where possible by aimed midwater trawling fitted with a sprat brailer. The net was fished with a vertical mouth opening of approximately 15m, which was observed using a Scanmar "Trawleye" netsounder. To facilitate determining the position of the net in the water column, a Scanmar depth sensor is also fitted to the headline.

Trawl catches are sorted to species level and then weighted. Depending on the number of fish, the sorted catch is normally sub-sampled for length measurements. Length frequencies are recorded in 0.5 cm length classes. Individual length-weight data are collected for all fish species contributing to the catches. Random samples of 50 herring (1+ gp) are taken from each catch for recording of biological parameters (length, weight, sex and maturity) and removal of otoliths for age determination.

2.7 Hydrographic data

Surface temperature and salinity were recorded using the through-flow thermosalinograph, and logged together with DGPS position at 1-minute intervals.

2.8 Data analysis

EDSUs were defined by 15 minute intervals which represented 2.5 nm per EDSU, assuming a survey speed of 10 knots. The surface-area backscattering (NASC) estimates are calculated for schools, school groups and scattering layers using a threshold of -60 dB. Targets in each 15-minute interval were allocated to species or species mixes by scrutinizing the echo charts together with acoustic records during trawling and maps of NASC values indicating location of trawls relative to school groups. In some cases, trawls with similar species and size composition are combined to give a more robust estimate of population length composition. Data were analysed using quarter rectangles of 15′ by 30′.

The single-species or mixed-species mean target strength (TS) is calculated from trawl data for each interval as 10 log {(Σs,l Ns,l.100.1.TSs,l) / Σs,l Ns,l } where Ns,l is the number of fish of species s in length class l. The values recommended by ICES for the parameters a and b of the length -TS relationship TS = a log (l) + b are used: a = 20 (all species); b = -71.2 (herring, sprat, horse mackerel), -84.9 (mackerel) and -67.5 (gadoids). The weighted mean TS is applied to the NASC value to give numbers per square nautical mile. For herring, this is further decomposed into densities by age class according to the length frequencies in the relevant target-identification trawls and the survey age–length key. Mean weights-at-age, calculated from length-weight parameters for the survey, is used to calculate biomass of herring from the estimated numbers-at-age. The weighted mean fish density is estimated for eachsurvey stratum (Figure 5B.1) using distance covered in each 15-minute EDSU as weighting factors, and raised by stratum surface area. Approximate standard errors are computed for the biomass estimates based on the variation between EDSUs within strata.

3. RESULTS

3.1 Biological data

Sampling intensity was relatively high during the 2015 survey with 31 successful trawls completed. Table 5B.2 gives the positions, catch composition and mean length by species for these trawl hauls. Twenty-eight hauls contained herring to be used in the analysis. The length frequency distributions of these hauls are illustrated in Figure 5B.2. Length frequency distributions reflect the general juvenile/adult herring distributions within the sampling area.

The resulting weight-length relationship for herring was calculated from the sampling information as $W = 0.00298*L^{3.321}$ (length measured in cm). The preliminary age length key (Table 5B.3) used in the analysis indicate that the population is composed of juveniles and adults fish (age 0-9).

3.2 Acoustic data

The distribution of the NASC values assigned to herring and to clupeoid mixes (juvenile herring and sprat) are presented in Figure 5B.3 and for herring only in Figure 5B.4. The highest abundance of herring was west Isle of Man and south off the Mull of Galloway.

3.3 Biomass estimates

The estimated biomass and number of herring and sprat by strata are given in Table 5B.4. The total number estimate comprises of ~91% age 0, ~6% age 1, ~2% age 2, ~0.3% age 3, ~0.2% age 4 and 0.4% age 5+.

4. DISCUSSION

The herring stock estimate in the survey area (Irish Sea/North Channel) was estimated to be 93,774t. The major contribution of ages to the total estimates is from ages 0 fish by number and weight.

The herring were fairly widely distributed within mixed schools at low abundance, with a few distinct high abundance areas. The largest herring aggregations were found northeast of the Isle of Man and off the Northern Ireland coast.

Sprat and 0-group herring were distributed around the periphery of the Irish Sea, with the most abundance of 0-group herring in the north and north east. The bulk of 1+ herring targets in 2015 were observed northwest of the Isle of Man and south from the Mull of Galloway (southwestern corner of stratum 5 and northwestern corner of stratum 7; Figure 5B.1&4), with a fairly scattered lower abundance observed throughout the Irish Sea (Figure 5B.4). The length frequencies generated from these trawls highlight the spatial heterogeneous nature of herring age groups in the Irish Sea (Figure 5B.2).

The estimate of herring SSB of 29,056t and the biomass estimate of 55,733t for 1+ ringers for 2015 is the lowest observed since 2007 and significantly lower than the 2014 estimates. The survey estimates are influencd by the timing of the spawning migration, but 2015 was an unusual year with warm conditions and the migration occurring much later than previously observed (this has also bee n confirmed by the undustry). The distribution of herring was also unlike previous observation where the usual high desities around the Isle of Man was much reduced, with a more homogenous distribution across the survey area, i.e., similar to the sprat/0-gp herring mixed shoals. This is also reflected in the higher proporption of 0-gp herring (33% of the herring biomass). The highest proposion of the 1+ biomass estimates was off the Irish coast (strata 3; 25%), which is again unsual and a reflection of the late migration into the Irish Sea. Results of a successive acoustic survey conducted later in September confirmed similar biomass estimates of what has been observed in the last 8 years. The evidence of very low abundance of spawning herring suggests poor reflection of the current age structure and abundance of the herring population in the Irish Sea. The survey results are still within the range of what has been observed historically and will have to be dealt with as a year effect within the assessment.

5 TABLES AND FIGURES

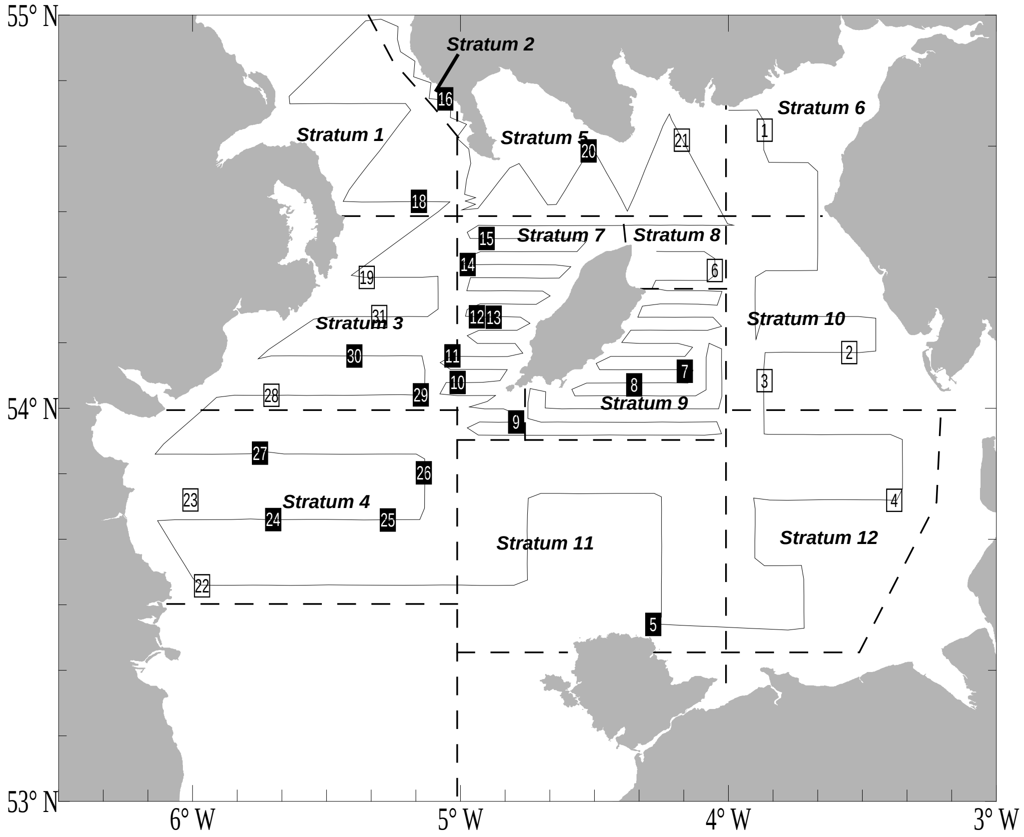


Figure 5B.1: Acoustic survey tracks with trawl positions of the 2015 Irish Sea and North Channel survey on RV "Corystes". Filled squares indicate trawls in which significant numbers of herring were caught or trawls with a high proportion of herring, while open squares indicate trawls with few or no herring.

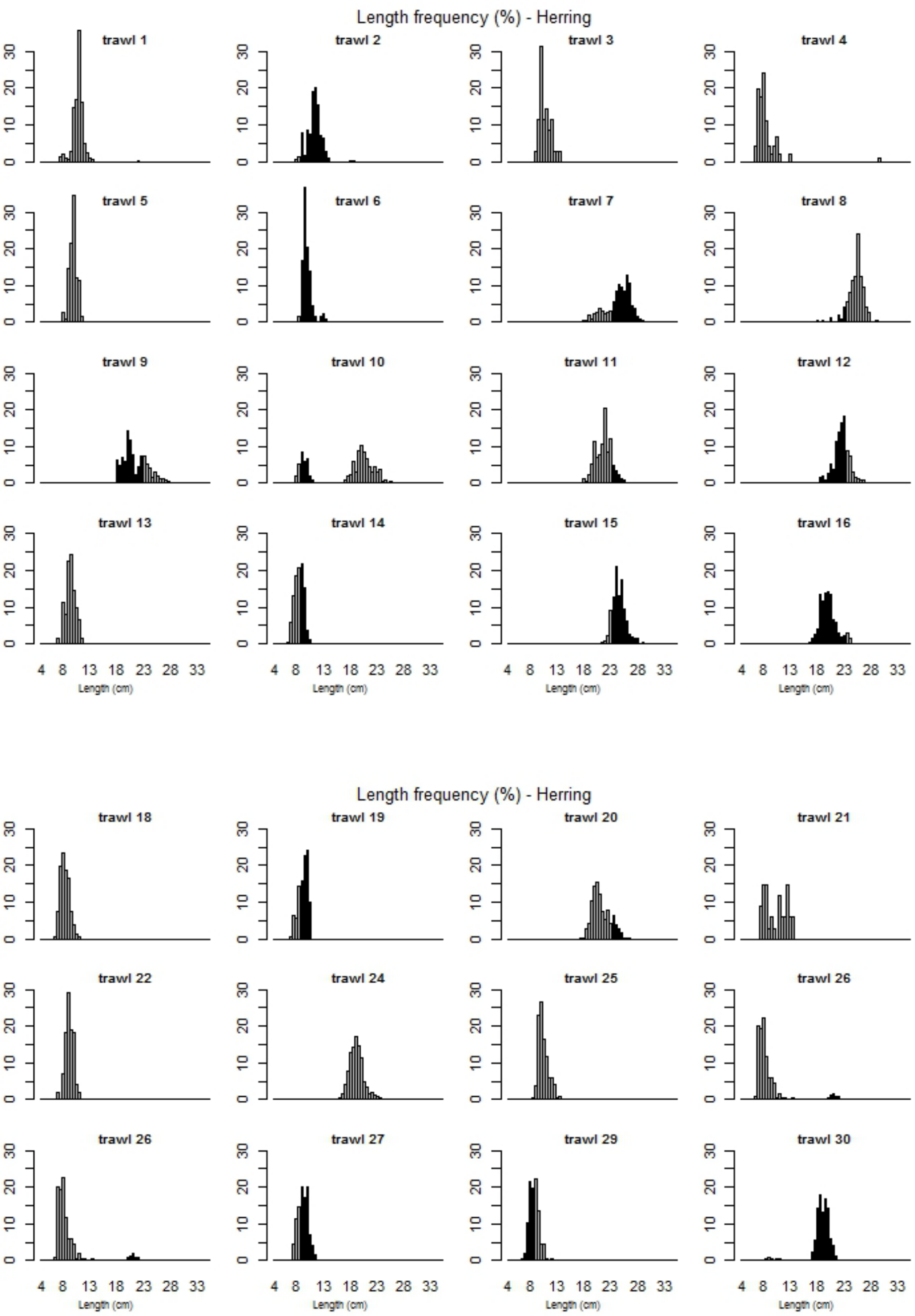


Figure 5B.2: Percentage length compositions of herring in each trawl sample in the September 2015 Irish Sea and North Channel acoustic survey on RV "Corystes".

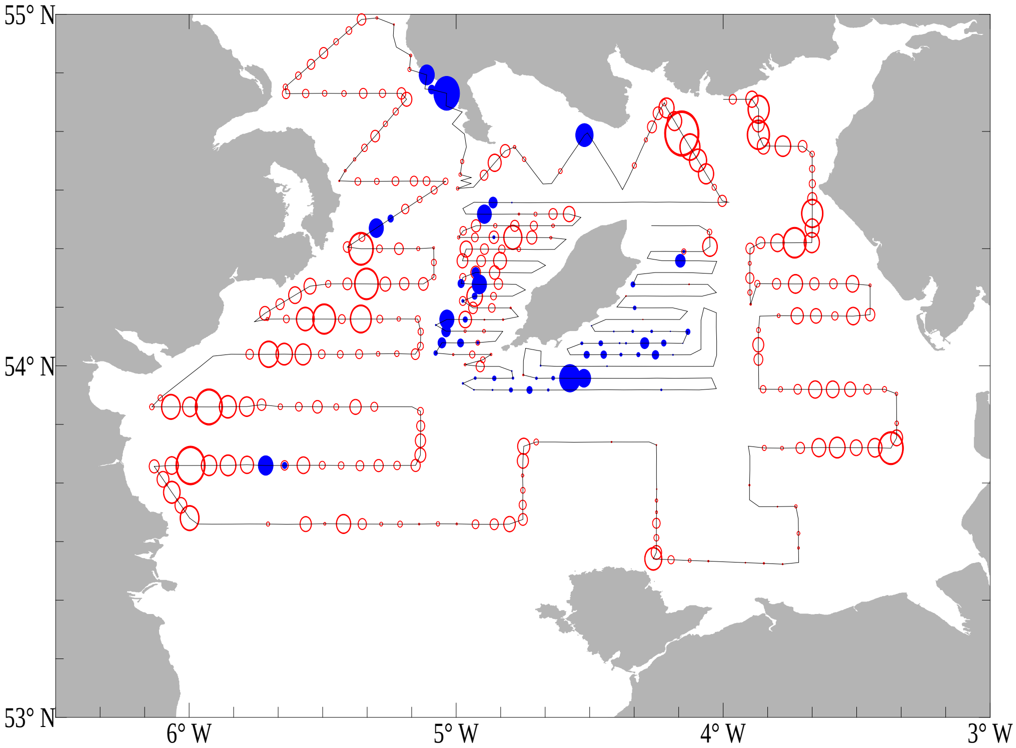


Figure 5B.3: Map of the Irish Sea and North Channel with a post plot showing the distribution of NASC values (size of elipses is proportional to square root of the NASC value per 15-minute interval) obtained during the 2015 acoustic survey on RV "Corystes". (a) Solid circles are for herring NASC values (maximum value was 5200) and (b) open circles are for clupeoid mix NASC, which include juvenile herring and sprat (maximum value was 9400).

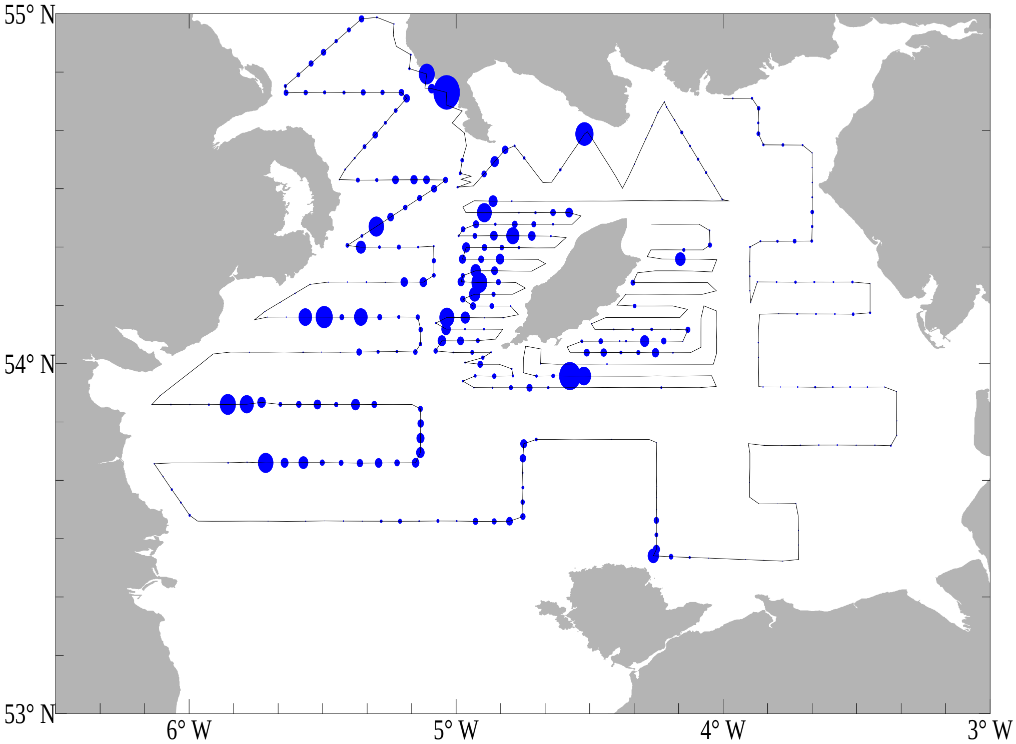


Figure 5B.4: Map of the Irish Sea and North Channel with a post plot showing the distribution of NASC values for assigned herring only (size of ellipses is proportional to square root of the NASC value per 15-minute interval) obtained during the 2015 acoustic survey on RV "Corystes" (maximum value was 5200).

Table 5B.1: Simrad EK60 and analysis settings used on the 2014 and 2015 Irish Sea and North Channel herring acoustic survey on RV "Corystes"

TRANSCEIVER MENU		
Year	2014	2015
Frequency	38 kHz	38 kHz
Sound speed	1513.9m.s^{-1}	1510.1.s^{-1}
Max. Power	2000 W	2000 W
Default Transducer Sv gain	24.80 dB	24.80 dB
Athw. Beam Angle Athw. Offset Angle Along. Beam Angle Along. Offset Angle	6.93 deg 0.05 deg 6.95 deg 0.12 deg	6.88 deg 0.05 deg 6.96 deg 0.11 deg
Calibration details		
TS of sphere	-33.6 dB	-33.6 dB
Range to sphere in calibration	12.1m	11.1m
Log Menu		
Integration performed in Echoview post-processing based on 15 minute EDSUs		
Operation Menu		
Ping interval	0.7 s	0.7 s
Analysis settings		
Bottom margin (backstep)	0.5 m	0.5 m
Integration start (absolute) depth	8 m	8 m
Sv gain threshold	-60 dB	-60 dB

Table 5B.2: Catch composition and position of hauls undertaken by the RV *Corystes* during the Irish Sea/North Channel survey, August/September 2015.

Tow	Date	Shooting details						Total fish	percentage composition of fish by weight							Mean length (cm)	
		Time	Lat.		Long.		depth (m)	catch kg.	sprat	herring	mackerel	scad	anchovy	whiting	other fish	sprat	herring
1	29/08/2015	15:22	54	42.44	3	51.87	27	230	91.82	7.12	0.87	0	0.01	0	0.18	7	11
2	30/08/2015	08:29	54	8.5	3	32.93	27	51	77.71	9.7	10.79	0	1.75	0	0.06	7.3	11.5
3	30/08/2015	13:19	54	4.21	3	51.91	60	221	94.6	0.3	5.09	0	0	0	0.01	10.7	11
4	30/08/2015	18:32	53	45.95	3	22.86	21	194	98.02	0.35	1.49	0	0.01	0	0.12	8.1	8.7
5	01/09/2015	18:54	53	27.01	4	16.83	42	61	42.45	36.13	18.82	0	0	2.33	0.27	8.7	10.2
6	09/09/2015	08:27	54	21.02	4	3.04	43	664	94.72	5.2	0.07	0	0	0	0.01	9.8	10.1
7	09/09/2015	22:00	54	5.65	4	9.75	40	136	0	62.58	37.42	0	0	0	0		24.7
8	09/09/2015	23:13	54	3.56	4	21.1	44	107	0	94.2	0.89	0	0	0	4.91		25.3
9	10/09/2015	19:33	53	57.9	4	47.54	59	212	0	94.47	5.53	0	0	0	0		21.6
10	10/09/2015	23:27	54	3.93	5	0.65	65	372	1.42	91.41	0.08	0	0	3.04	4.06	7.9	17.3
11	10/09/2015	03:34	54	7.99	5	1.79	83	363	0	100	0	0	0	0	0		22
12	11/09/2015	08:25	54	13.96	4	56.31	89	1281	0	100	0	0	0	0	0		22.7
13	11/09/2015	09:10	54	13.89	4	52.55	71	32	65.94	32.83	1.04	0	0	0.18	0	8	9.6
14	11/09/2015	16:07	54	21.93	4	58.39	132	41	52.08	47.61	0.31	0	0	0	0	7.7	8.8
15	11/09/2015	20:52	54	25.91	4	54.17	69	145	0	100	0	0	0	0	0		24.8
16	13/09/2015	02:45	54	47.21	5	3.4	25	61	0	98.12	1.88	0	0	0	0		20.2
17	13/09/2015	08:43	54	46.65	5	32.32	82	2	70.62	1.75	25.32	0	0	2.3	0.01	7.5	10.3
18	13/09/2015	14:25	54	31.58	5	9.29	136	55	9.42	31.83	0.23	0	0	4.96	53.55	7.8	8.6
19	13/09/2015	17:43	54	19.96	5	20.99	67	207	75.06	23.5	1.43	0	0	0	0	7.5	9.5
20	14/09/2015	00:03	54	39.27	4	31.31	34	267	0	95.34	4.52	0	0	0.07	0.07		21.5
21	14/09/2015	05:44	54	40.92	4	10.42	37	36	98.35	1.65	0	0	0	0	0	7.1	10.5
22	15/09/2015	05:12	53	32.89	5	57.87	32	49	70.58	1.1	0.26	0	0	28.02	0.03	7.6	9.4
23	15/09/2015	08:23	53	46	6	0.47	34	604	90.34	0	9.66	0	0	0	0	8.2	
24	15/09/2015	10:44	53	43	5	41.95	86	565	0	13.45	0.11	0	0	79.78	6.66		19.4
25	15/09/2015	13:14	53	42.94	5	16.27	77	31	34.84	59.57	0	0.02	0	0	5.57	9.2	10.7
26	15/09/2015	16:36	53	50.14	5	8.21	69	53	20.15	57.15	1.71	0.14	0	5.78	15.06	9.4	9.1
27	16/09/2015	07:20	53	53.15	5	44.89	63	54	13.56	85.27	1.17	0	0	0	0	7.4	9.5
28	16/09/2015	12:07	54	1.98	5	42.33	48.6	521	75.54	0	24.46	0	0	0	0	10.5	
29	16/09/2015	14:59	54	2.04	5	8.88	77	22	65.65	33.42	0.32	0	0	0.4	0.21	7.1	8.9
30	16/09/2015	18:10	54	7.97	5	23.76	60	689	20.97	77.9	1.13	0	0	0	0	10.2	19
31	17/09/2015	07:30	54	13.99	5	18.19	65	206	96.97	0.44	2.56	0	0	0.02	0.01	7.6	10

Table 5B.3: Preliminary age-length key for herring from which otoliths were removed at sea during the Irish Sea/North Channel survey. Data are numbers of fish at age in each length class in samples collected from each trawl.

AGE CLASS
(RINGS, OR AGES ASSUMING 1 JANUARY BIRTHDATE)

LENGTH (CM)	0	1	2	3	4	5	6	7	8+	TOTAL
6.5	5									5
7	8									8
7.5	10									10
8	13									13
8.5	14									14
9	16									16
9.5	18									18
10	16									16
10.5	16									16
11	14									14
11.5	10									10
12	6									6
12.5	5									5
13	6									6
13.5	6									6
14	1									1
14.5	1									1
15	1									1
15.5		1								1
16	1	4								5
16.5		6								6
17		11								11
17.5		20								20
18		27								27
18.5		24								24
19		31								31
19.5		31								31
20		35								35
20.5		38	1							39
21		24	1							25
21.5		20	2							22
22		10	14							24
22.5		6	20							26
23			25	2						27
23.5		1	22	3						26
24			22	6						28
24.5			14	8	1					23
25			10	5	7	1	1			24
25.5			8	4	7	6	1	1		27
26			3	2	4	2	5		1	17
26.5				1	2	4	3		1	11
27				1	6	2	2	4	4	19
27.5				1	2		3	1	6	13
28				1	1	1	2		1	6
28.5								1	2	3
29					1	1		1	4	7
29.5									1	1
30										
30.5										
TOTAL	167	289	142	34	31	17	17	8	20	725

Table 5B.4: Acoustic survey estimates of biomass (t) and numbers ('000) of herring and sprat by survey stratum from the AFBI acoustic surveys in 2015.

Stratum	No. sprat	Biomass sprat	No. Her	Biomass Her
1	1464696	4393	896102	3502
2	21604	64	164084	11232
3	6286092	29697	1482315	25300
4	12266702	58155	2311937	20315
5	5437881	13776	264773	4740
6	4456129	10426	85902	765
7	1135310	4000	697544	8494
8	146211	1040	9071	131
9	3433	16	57908	7809
10	7512372	34941	139204	1202
11	3749146	17270	1590040	10062
12	5825192	25284	28679	222
Total	48304767	199063	7727559	93774

Annex 5c: Celtic Sea Herring Acoustic Survey (CSHAS)

Survey Summary table	
Name of the survey (abbreviation):	Celtic Sea Herring Acoustic Survey (CSHAS)
Summary:	**Cruise Report Link: http://hdl.handle.net/10793/1194**
The survey was carried out as planned and no time was lost due to weather. Survey design was modified in 2016 by increasing the broad scale survey area to prove containment. The broad scale survey used a laddered approach generating 2 independent estimates for the wider area. High intensity adaptive surveys were carried out on localised high density offshore aggregations in the Celtic Deep. Several individual surveys were carried out over several days and day/night cycles. Broad scale surveys yielded low herring biomass (Pass 1:~400t and Pass 2:~10,000t) with fish distributed in inshore coastal waters and composed of 16% and 49% of immature fish respectively. The high intensity adaptive surveys were predominantly made up of mature fish with the exception of one small area and contained the bulk of the standing stock. Issues exist with the accuracy of adaptive survey biomass estimates not related to the methodology employed but the behaviour of the fish when hyper-aggregated in offshore regions.	
	Description
Survey design	Stratified systematic parallel design (8 nmi spacing) with randomised start point for broad scale survey. High intensity stratified adaptive surveys (1 nmi spacing) on highly localised offshore aggregations.
Index Calculation method	StoX (via the ICES database)
Random/systematic error issues	Majority of the stock has been aggregated into a highly localised and discreet area offshore over the last number of years during the survey. When highly aggregated in this way school behaviour inhibits accurate measurements acoustically as fish are located tight on the seabed and within the acoustic deadzone (ADZ) over a wide area. As a result the accuracy of survey estimates should be treated with a degree of caution.
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	NA, good weather dominated the survey
Extinction (shadowing)	ADZ presented more of an issue for the adaptive surveys
Blind zone	NA
Dead zone	High intensity surveys carried out on herring aggregations within <0.5m of the seabed and in the ADZ
Allocation of backscatter to species	Directed trawling for verification purposes
Target strength	Recommended values for target species
Calibration	All survey frequencies calibrated and results within recommended tolerances

Annex 5d: Western European Pelagic Acoustic Survey (WESPAS)

Survey Summary table	
Name of the survey (abbreviation):	Western European Pelagic Acoustic Survey (WESPAS)
Summary:	**Cruise Report Link:** http://hdl.handle.net/10793/1179
The objectives of the survey were carried out successfully and as planned. Good weather conditions dominated for the majority of the survey resulting in less than 24 hours downtime over the 42 day survey period. Comprehensive trawling was carried out over the course of the survey (n=47) providing good confidence in school recognition and supporting biological data for age stratified abundance estimation of target species (herring, boarfish, horse mackerel). Herring distribution was notably different from previous years within the MS survey area and was concentrated in the north or 56°N. Biomass, as compared to 2015 was much reduced but the age structure was comparable. Boarfish distribution was comparable within the time series. Biomass was lower compared to 2015 continuing the downward trend in this time series. The age profile of the stock was comparable. Survey effort, timing and coverage were comparable to previous years and the same vessel and sampling equipment (transducers and trawl) were used for the herring component. Equipment changed for the boarfish survey component (transducers and trawl).	
	Description
Survey design	Stratified systematic parallel design (15 & 7.5 nmi spacing) with randomised start point.
Index Calculation method	StoX (via the ICES database)
Random/systematic error issues	NA, outside of those described for standardised acoustic surveys
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	NA, good weather dominated the survey
Extinction (shadowing)	No particular issues as target schools primarily located in the lower water column.
Blind zone	NA
Dead zone	Possibility of issue with species tight on the seabed, namely horse mackerel
Allocation of backscatter to species	Directed trawling for verification purposes
Target strength	Recommended values for target species
Calibration	All survey frequencies calibrated and results within recommended tolerances

Annex 5e: Pelagic Ecosystem Survey in the Western Channel and Celtic Sea (PELTIC)

Survey Summary table	
Name of the survey (abbreviation):	PELTIC
Summary:	
The PELTIC survey is an annual autumn survey which focuses on the distribution, abundance and age structure of small pelagic fish species in ICES Divisions VIIe-f, predominantly sprat, sardine, mackerel and anchovy. Of equal importance is the aim to improve the understanding of the role of these mid-trophic species in the pelagic ecosystem by simultaneously sampling the multiple trophic levels (top predators, zooplankton, phytoplankton) and the physical oceanography. The survey is carried out over ~18 days in October on board the RV 'Cefas Endeavour'.	
	Description
Survey design	Stratified systematic parallel design (10 nmi spacing) with randomised start point. Daylight acoustic only
Index Calculation method	Custom, but moving to EchoR
Random / systematic error issues	NA, outside of those described for standardised acoustic surveys
Specific survey error issues (acoustic)	*There are some bias considerations that apply to acoustic-trawl surveys only, and the respective SISP should outline how these are evaluated:*
Bubble sweep down	Filer removed "empty" pings during spells of bad weather
Extinction (shadowing)	Not dealt with as generally schools not too dense to be an issue
Blind zone	12 m (with drop keel down to 3m below hull 3+4 m + 5m nearfield); during daylight not thought to be a massive issue apart from some mackerel schools right at the surface. At night several species move to surface (hence daylight survey only)
Dead zone	1m –possible issues with horse mackerel; other species thought to be above 1m
Allocation of backscatter to species	Backscatter allocated to several echotypes, each of which may be a single species or mixed species, the identity of which is determined by the acoustic equivalent of the directed trawl catches (sensu Mathieu Doray)
Target strength	@ 38kHz: Herring, sprat, sardine and anchovy: -71.2; boarfish = -66.2; horse mackerel = -68.9; gadoids = -67.4 @200 kHz: mackerel = -81.9 (under review)
Calibration	Start of each survey although occasionally conducted at later stage; manual procedure

DRAFT Survey report CEND22_16

PELTIC16: Small pelagic fish in the coastal waters of the western Channel and Celtic Sea

Jeroen van der Kooij, Elisa Capuzzo, Joana Silva, Mike Bailey, Sophie Pitois and Paul Bouch

Survey report CEND22_16

PELTIC16: Small pelagic fish in the coastal waters of the western Channel and Celtic Sea

Jeroen van der Kooij, Elisa Capuzzo, Joana Silva, Mike Bailey

1. Outline of the survey

STAFF:
1. Jeroen van der Kooij (SIC)
2. Elisa Capuzzo (2IC)
3. Joana Silva (2IC)
4. Marc Whybrow
5. Richard Humphreys
6. Matt Eade
7. Paul Bouch
8. James Pettigrew
9. Sophie Pitois
10. Tom Hull
11. Julian Tilbury (Plymouth University)
12. Mike Bailey (Observer)
13. Sean Minns (Observer)
14. Peter Howlett (Observer)

1.2. **Duration**: 3rd – 19st of October

1.3 Location

Western Channel and Celtic Sea coastal zone (embarking in Portland and disembarking in Swansea)

1.4 Objectives

1. To carry out the fifth and final of five annual multidisciplinary pelagic surveys of the Western Channel and Celtic Sea waters as part of project Poseidon, to estimate the biomass of-, and gain insight into the population of the small pelagic fish community (sprat, sardine, mackerel, anchovy, horse mackerel, herring).
   a. To carry out a fisheries acoustic survey during daylight only using four operating frequencies (38, 120, 200 and 333 kHz) to investigate:
      - distribution of small pelagic species
      - abundance of small pelagic species
      - distribution of the pelagic species in relation to their environment
   b. To trawl for small pelagic species using a 20x40m herring (mid-water) trawl (taking the Cosmos Fotø and Engels 800 as back up) in order to obtain information on:
      - Species- and size composition of acoustic marks
      - Age-composition and distribution, from all small pelagic species
      - Length weight and maturity information on pelagic species
      - Stomach contents (see also 11)
2. To collect plankton samples using 2 different mesh ringnets (80 µm, and 270 µm mesh) at fixed stations along the acoustic transects (marked in red in below map) at night by vertical haul. Samples will be processed onboard:

   a. Ichtyoplankton (eggs and larvae, 270 µm) of pelagic species will be identified, counted and (in case of clupeids) measured onboard and combined with information from maturity to identify spawning areas.
   b. Zooplankton samples (from ringnet with 80 µm mesh) will be stored for further analysis back in the lab.
3. Water column sampling. At fixed stations along the acoustic transect, marked in yellow on below map, an ESM2 will be deployed to obtain a vertical profile of the water column. Water column profiles and water samples will provide information on chlorophyll concentration, dissolved oxygen concentration, salinity, temperature, inorganic nutrients concentration and the relevant QAQC samples for calibration of the equipment. Water samples will be collected and fixed on board for analysis post-hoc.
4. Seabirds and Marine Mammals. Locations, species, numbers and activities observed will be recorded continuously during daylight hours by three Marinelife observers from bridge.
5. Additional high resolution ESAS observations will be conducted on critically endangered Balearic shearwaters and other seabirds as part of a collaborative Defra funded project between MarineLife, Natural England and Cefas.
6. Ferrybox Continuous CTD/Thermo-salinigraph/pCO2. Continuously collect oceanographic data at the sea surface (4 m depth) during steaming.
7. To conduct further experiments with the online flow-cytometer to obtain continuous data on phytoplankton functional groups in collaboration with project JERICO NEXT.
8. To collect discrete samples of phytoplankton and micro-zooplankton at predetermined 18 primary stations for further analysis back to the lab (species composition, abundance, biomass and size distribution).
9. To test an automatic continuous zooplankton camera in collaboration with PML (Julian Tilbury).
10. To collect juvenile mackerel for AZTI (Paula Alvarez) in support of genetic study.
11. To collect jellyfish for PhD student Katie St John Glew in support of isotope study

1.5 Narrative

Staff from Cefas, MarineLife and Plymouth University joined the RV Cefas Endeavour in the afternoon of Sunday the 2nd of October from 16:00 BST. After initial gear-check and -set up in the afternoon and early evening, plus a safety induction for the relevant staff, the vessel left Portland at 06:00 on the 3rd of October, steaming straight to the calibration site off West Bay, west of Portland Bill. Whilst steaming staff were run through relevant dynamic risk assessments. A weighted parachute line was guided round the hull before the anchor was dropped. First the new rosette was deployed to ensure some recent alterations were successful and to train the oceanographic staff in its use. After successful deployment Tom Hull disembarked by searider and was dropped off on land (in West Bay) as planned. At the same time, at approximately 9:00 BST the plankton ringnets plus SAIV mini CTD were tested and the calibration of the echosounders commenced. Although the calibration spheres were briefly detected on the echosounder, the spring tides proved too strong to keep the targets in the beam. Despite further attempts during three slack tide periods, the spheres were not detected again and the calibration exercise was postponed, particularly as the weather conditions were picking up. During this period a toolbox talk was conducted. At ~19:00 BST we came off station and started sampling the primary stations (using Rosette and Plankton ringnets), which continued throughout the night.

On Monday morning the 4th of October the survey started proper, commencing first with the eastern most transects of the western English Channel. Similar to the previous two years' surveys, fisheries acoustic transects, trawling and bird and mammal observations were conducted during daylight hours, and CTD- and plankton stations were covered during the night. The exception was a number of inshore stations located in areas with static gear which were sampled during daylight, to maximise visibility. On a few occasions acoustic data acquisition continued after dusk to complete remainders of transects. During ~40 of the zooplankton stations the CALPS system (Cefas' Automatic Litter and Plankton Sampler) was switched on to collect surface zooplankton

It was decided to use the first targeted trawl as a shake-down tow, taking extra time for all involved to get used to gear. As it turned out, the whole process went very smoothly. For the duration of the survey, when appropriate, the pelagic trawl was deployed to ascertain the species- and length composition of acoustic targets, or ‘marks’. In total 15 successful trawls were conducted. On a few occasions no trawl could be conducted despite the presence of targets on the echogram. The main reasons were adverse weather and swell conditions (~ 3 days), presence of static gear and schools close to hard seabed substrate in areas of string relief.

During the 5th of October, acoustic data acquisition was stopped around mid-day as the data quality deteriorated due to the bad weather. Work was resumed on the 6th of October and continued throughout the rest of the survey. During a deployment of the trawl on the 8th of October the starboard G-link came off the pennant, delaying the deployment. During this trawl, several of the floats were removed around the Marport bag to improve its tilt angle for better communication with the dropkeel based transducer. This had the desired effect. On the morning of the 9th of October one of the three engines had to be switched off to enable repairs. The acoustic transect was able to be continued at 10 knots due to favourable swell and tide conditions, but no trawling operation could be conducted during this period. This was resolved in the afternoon and after completion of transects the RV sailed to some fish aggregations spotted earlier in the day to shoot the trawl. From the 16th late morning through to the 18th of October, survey conditions inside the Bristol Channel deteriorated due to gradual westward shift of winds which, in periods, compromised the acoustic data quality although it was not sufficiently bad to stop data acquisition.

The last of the night-time prime stations (Rosette and plankton) were completed on the 16th of October, which enabled the night shift to be moved back to day shifts to acclimatise before docking. Despite the fact that the survey programme had been adapted to accommodate for the reduced survey duration and as a result the acoustic transects around the Isles of Scilly were dropped, the primary stations of this area were successfully completed providing information on the physical oceanography and sardine eggs and larvae. The final acoustic transects of the regular survey design were completed on the 18th of October. On the morning of the 19th a final trawl was conducted on some fish aggregations observed the day before after which transect 39 was run from an approximate halfway point to the inner Bristol Channel. The vessel steamed to meet the pilot and docked in Swansea at approximately 19:45.

2. Material and Methods

2.1. Study area

The survey was conducted according to the PELTIC survey grid (Fig 1) established in 2012. Acoustic transects, plankton and water sampling were undertaken along the predefined transects, undertaken in a generally east to west direction for the first half of the survey, then a south-west to north east direction for the second half of the survey. Trawls were undertaken opportunistically, depending on the presence and type of acoustic marks observed. Acoustic data acquisition, trawling operation and marine mammal and bird observations were conducted during daylight hours, whereas the primary stations (plankton and water sampling) were conducted during the night. Due to the (planned) reduction in survey duration by two days it was decided to drop the acoustic transects around the Isles of Scilly. However, the primary stations were all completed, including those around the Isles of Scilly.

2.2 Fisheries acoustics

2.2.1. Acquisition

Fisheries acoustics were recorded along the pre-designed transects (Fig. 1) at the four operating frequencies (38, 120, 200 and 333 kHz). The transducers were mounted on a drop keel which was lowered to 3.0 m below the hull, 8.3 m below the sea surface. Pulse duration was set to 0.512 ms for the 38-200 kHz frequencies and to 1.024 for the 333 kHz frequency (as better results were obtained) and the ping rate was set to 0.5 pings s^{-1}. During the first 10 days, fairly persistent easterly winds caused occasional interference although the 38kHz echogram remained of good quality. During the last week, winds turned westerly and caused further periods of poor data quality largely due to surface aeration. At all times on-transect live acoustic data were monitored and when unidentified acoustic marks appeared the trawl was shot where possible to identify these marks.

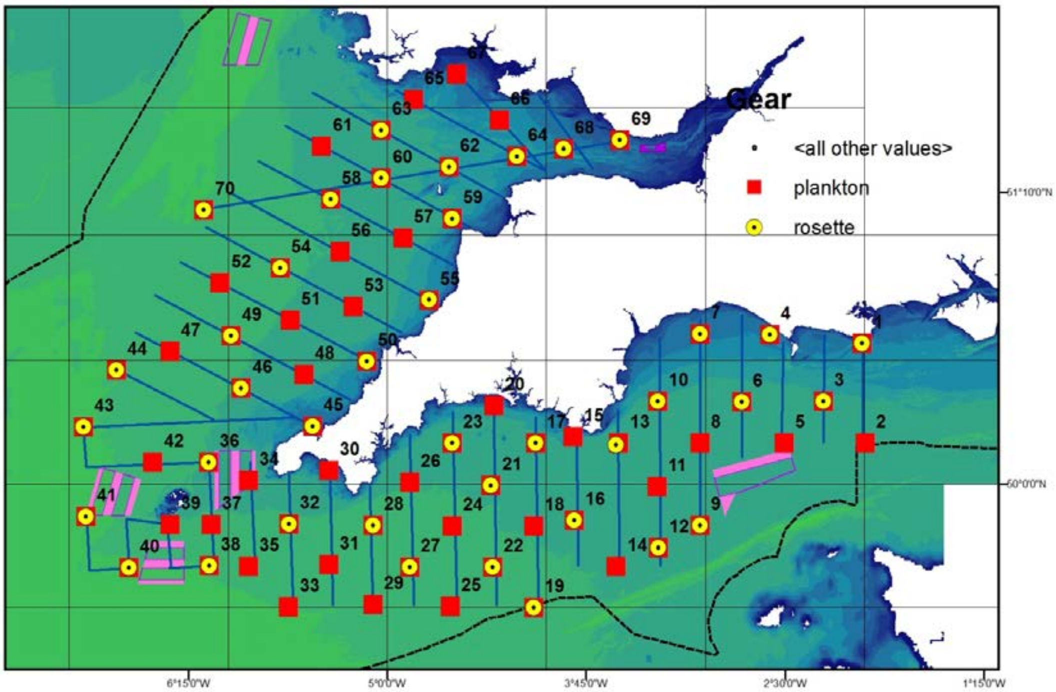


Figure 1. Overview of the survey area, with the acoustic transect (blue lines), plankton stations (red squares) and hydrographic stations (Yellow circles).

2.2.2. Processing

Acoustic data were cleaned, which included removal of data collected during fishing operations. Both the on-transect data and those collected during the steam between transects were retained. Only the former was used for further biomass estimates but the inter-transect data was retained and cleaned for future studies on spatial distribution of predators and prey. A surface exclusion line was set at 13 m and acoustic data below 1 m above the seabed were also removed to exclude the strong signals from the seabed. Large amounts of plankton were present throughout the survey, often represented in layers on all three acoustic frequencies (although at different strengths depending on the organisms). Fish schools and plankton were often mixed and a simple extraction of fish echoes was not possible. Therefore, to distinguish between organisms with different acoustic properties (echotypes) a multi-frequency algorithm developed in 2012 was refined to separate echograms for each of the echotypes (Fig. 2). The echogram with only the echoes from fish with swimbladders was then scrutinised and attributed to individual species based on expertise and the nearest relevant trawls, using imagery of sonar and netsonde collected during the trawling process to assess the sampling performance in relation to the acoustic marks.

In the case of mackerel a separate algorithm was used (following Korneliussen 2010). An additional bad weather filter was developed which removed “empty” pings as a result of adverse weather conditions. This was applied only on files which were affected by bad weather.

2.3 Fishing and catch sampling

A heavy duty ‘herring’ trawl (20 x 40m v d K Herring trawl, KT nets) was used to sample the pelagic community for the purpose of validating acoustic marks and collecting biological samples. A wireless 50 kHz Marport net-sonde was mounted on the head-rope of the trawl at the mouth of the net, which allowed for live monitoring of the trawling performance. Trawling operations went very well with no gear damage.

Fish were sorted to species and size categories before the total catch was weighed and measured using the Cefas Electronic Data Collection (EDC) system. In the case of very large catches, subsamples were taken before weighing and measuring. The sex and maturity of the pelagic species in each trawl was assessed (up to 5 per length class of mackerel, sprat, sardine, anchovy, horse mackerel, garfish, herring), and their otoliths and stomachs were dissected out and removed for later analysis. For the stomachs a total of up to 25 stomachs were taken across the various length categories per species per catch.

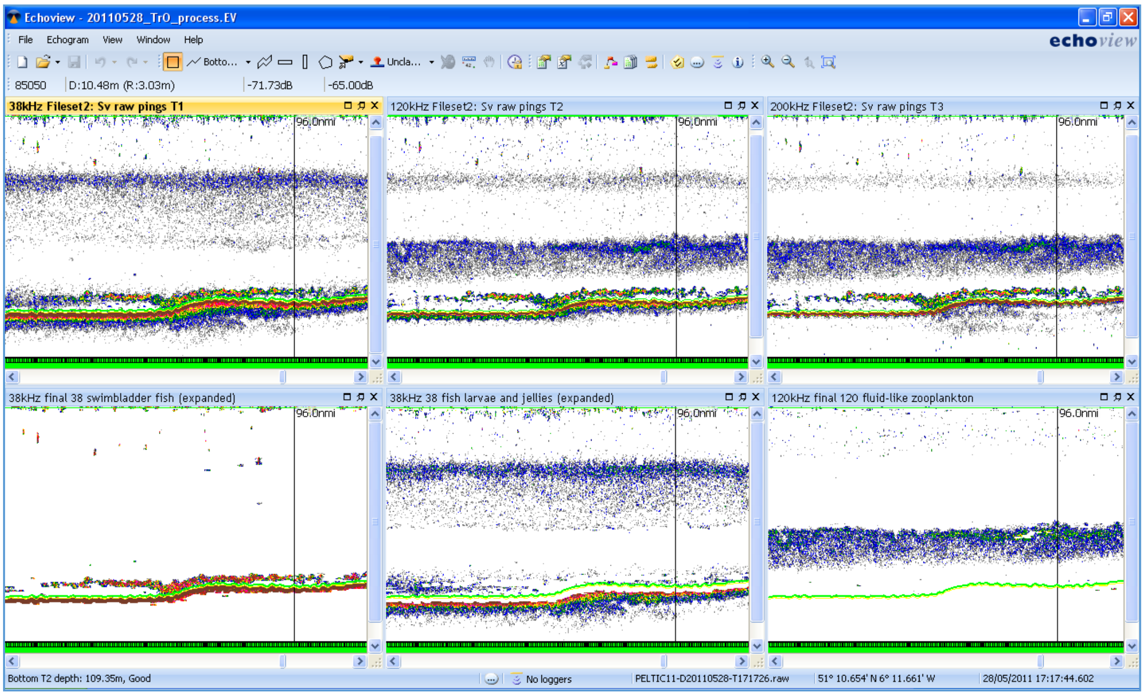


Figure 2. Dataflow of algorithm (top) used to divide the acoustic data by echotype. Screen-shot example (bottom) with raw echograms of 38, 120 and 200 kHz (top panels) and three examples of extracted echotypes (bottom panel from left to righ): fish with swimbladder (sardine schools at surface and myctophids layer near seabed), fish larvae/ jellyfish and zooplankton (dense krill layer).

2.4 Zooplankton

2.4.1. Ringnets

The various planktonic size components were sampled at 71 fixed plankton stations along the various transects using two ringnets of different mesh: 270 µm (ichtyoplankton and macro-zooplankton) and 80 µm (zooplankton). The two ringnets were fixed to a frame which enabled them to be deployed simultaneously. Both nets had flowmeters (General Oceanics mechanical flowmeters with standard rotor, model 2030R) mounted in the centre of the aperture of the net and a mini-CTD (SAIV) was attached to the bridle. Position, date, time, seabed depth, sampled depth (from CTD attached to net) and flowmeter reading were recorded. Nets were washed down on hauling and samples were transferred from the terminal mesh grid. When possible, samples from the 270 µm mesh were transferred into jars and immediately analysed under a binocular microscope before the full sample was preserved in 4% buffered formaldehyde. If immediate analysis was not possible, samples were transferred into 1 lb glass jars and preserved before analysis on a later day during the survey. Ichthyoplankton (eggs and larvae) and macrozooplankton from the 270 µm samples were counted, aged and, in the case of clupeid larvae, measured and raised using flow meter derived sample volumes. Samples from the 80 µm mesh were transferred into jars and preserved with 4% buffered formaldehyde for later analysis using a zooscan in the lab.

2.4.2. Microzooplankton

At a subset of 18 prime stations two water sample were taken and fixed on lugol, one for phytoplankton analysis back in the lab and one for micro-zooplankton analysis.

2.4.3. CALPS

At 40 ringnet stations additional surface samples of zooplankton were taken using the CALPS (Cefas Autonomous Litter and Plankton Sampler). For an hour at each of these stations a sample was taken using an 80 µm mesh net to be compared with the vertical casts, starting ~20 mins before arriving at the station, running during the station and continuing until ~20 mins after the station.

2.4.4. Plankton Image Analyser

A Plankton Image Analyser (PIA) system was trialled during the Peltic survey. PIA is a real-time high speed instrument developed by Phil Culverhouse (University of Plymouth) that continuously takes samples from a water inlet (the same one used by the CALPS) whilst underway. As the pumped water passes through a flow-cell, the PIA takes images of the passing particles. Those images will be sent to a recognition software which will classify them into categories corresponding to zooplankton taxonomic groups. The PIA was ran for the entire duration of the cruise, collecting over 10 million images of zooplankton throughout the sea trip.

2.5 Oceanography

A Ferrybox system provided continuous subsurface measurements in real time of various environmental variables (e.g. temperature, salinity, fluorescence and dissolved oxygen) during steaming. In addition, weekly maps of sea surface temperature, frontal systems, and chlorophyll concentration were obtained from Neodaas (www.neodaas.ac.uk). The Ferrybox was connected to a flow cytometer, which performed hourly measurements of the size and abundance of pico- and nano-phytoplankton populations in the water.

Vertical profiles of temperature, salinity, fluorescence, optical backscatter, dissolved oxygen and Photosynthetically Available Radiation (PAR) were collected at 38 sampling stations using a Rosette sampler equipped with a SeaBird CTD, in calm and moderate sea states. An ESM2 profiler was used instead in rough sea conditions.

At 18 of these 38 sampling stations, surface water samples for analysis and calibration of salinity, inorganic nutrients, dissolved oxygen, and phytoplankton pigments were collected using the Rosette sampler, or, when not in use (during periods of adverse weather), from the continuous water pump that supplies the Ferrybox. At the same 18 stations further surface samples for analysis of phytoplankton and microzooplankton communities were collected; at one of these stations, prime station 27, samples were also collected at depth, due to the presence of a Deep Chlorophyll Maximum.

Samples for analysis of dissolved oxygen concentration, salinity and phytoplankton pigments will be used for calibrating the sensors of the SeaBird CTD, of the ESM2 profiler and of the Ferrybox. A summary of the samples collected, and of the CTD profiles carried out during the survey, is given in Table 1.

Table 1. Samples collected during the survey and number of profiles carried out.

Salinity	19
Dissolved oxygen	8 (x3)
Chlorophyll/Pigments analysis	40
Inorganic nutrients	20
Phytoplankton	19
Microzooplankton	19
CTD profiles with Rosette SeaBird	28
CTD profiles with ESM2	10

2.6 Top predators

For the second year running, two different but complimentary approaches were taken to record birds and marine mammals. On the Bridge wing of one side of the vessel (selected as appropriate to minimise sun glare), two experienced JNCC-accredited European Seabirds At Sea (ESAS) surveyors (Mike Bailey and Sean Minns) employed an effort-based distance sampling straight-line transect survey following strict ESAS methodology, whilst on the other Bridge wing, a single experienced volunteer

MARINElife surveyor (Peter Howlett) employed an adapted and slightly simplified version of this methodology. As a result, a 90° bow-to-beam scan area was surveyed by the ESAS team along transect lines during daylight hours, and with the additional coverage provided by the MARINElife surveyor, a 180° scan area was surveyed along every transect line. During transits between transects, both teams maintained incidental observations whenever possible, logging significant species only. Furthermore, observations were regularly conducted during the net-retrieval stage of many trawls to identify species of birds associated with the fishing activity of the survey vessel but only significant species were logged as incidental records. All species of birds (both seabirds and terrestrial migrants) were recorded, along with all sightings of marine mammals.

ESAS methodology aims to achieve an assessment of the numbers and distribution of animals in a designated quantifiable area by employing a sampling method so that numbers can be extrapolated into the entirety of the study zone. ESAS methodology is an internationally recognised sampling method conforming to internationally accepted standards enabling data to be compared with surveys elsewhere.

It is recommended that ESAS surveys only occur in sea state 4 or less, although the effects of environmental conditions on surveyability are very vessel dependent. Frustratingly, the weather conditions during this 2016 Peltic survey regularly exceeded sea state 4 (reaching sea state 8 on one day) meaning that some of the data will be unusable using the usual ESAS analysis methods.

The single MARINElife surveyor adopted a transect on the opposite side of the vessel to the side used by ESAS observers (and was therefore frequently affected by sunglare). Priority was given to detecting marine mammals, often at significant distance, so the use of binoculars was far more frequent, and this undoubtedly affects the detectability and reliability of recording each bird within transect. In addition to cetaceans, specific effort was made to detect Balearic Shearwater (Puffinus mauretanicus), and any other birds. Communication between the two teams was maintained throughout via two-way PMR446 radio to ensure that any unusual or significant sightings were corroborated, although in reality this was sometimes impossible to do when large aggregations were encountered and when the vessel's bulkhead prevented viewing across to the opposite transect. Otherwise, all data recorded by the two teams was kept separate to ensure independence when detecting animals.

During the deployment of the fishing net, both teams paused effort. However, during the net-retrieval phase, incidental records of significant species was logged (e.g. Balearic Shearwater, Sooty Shearwater, cetaceans) whenever time permitted. Observations were conducted from the rear of the Bridge to cover a 180° arc, aft of the vessel. Whilst this data was not part of the standard transect data it provided an opportunity to observe behaviour and associations with a fishing vessel and could provide useful comparisons with future surveys in these waters.

3. Preliminary results

3.1. Pelagic Ichthyofauna

After removing the off-transect data a total of ~1200 nautical miles of acoustic sampling units were collected for further analysis (Fig. 3). A total of 15 successful trawls were made (Fig. 3). The trawls were evenly spread across the survey area, providing a suitable source of species and length data to partition the acoustic data.

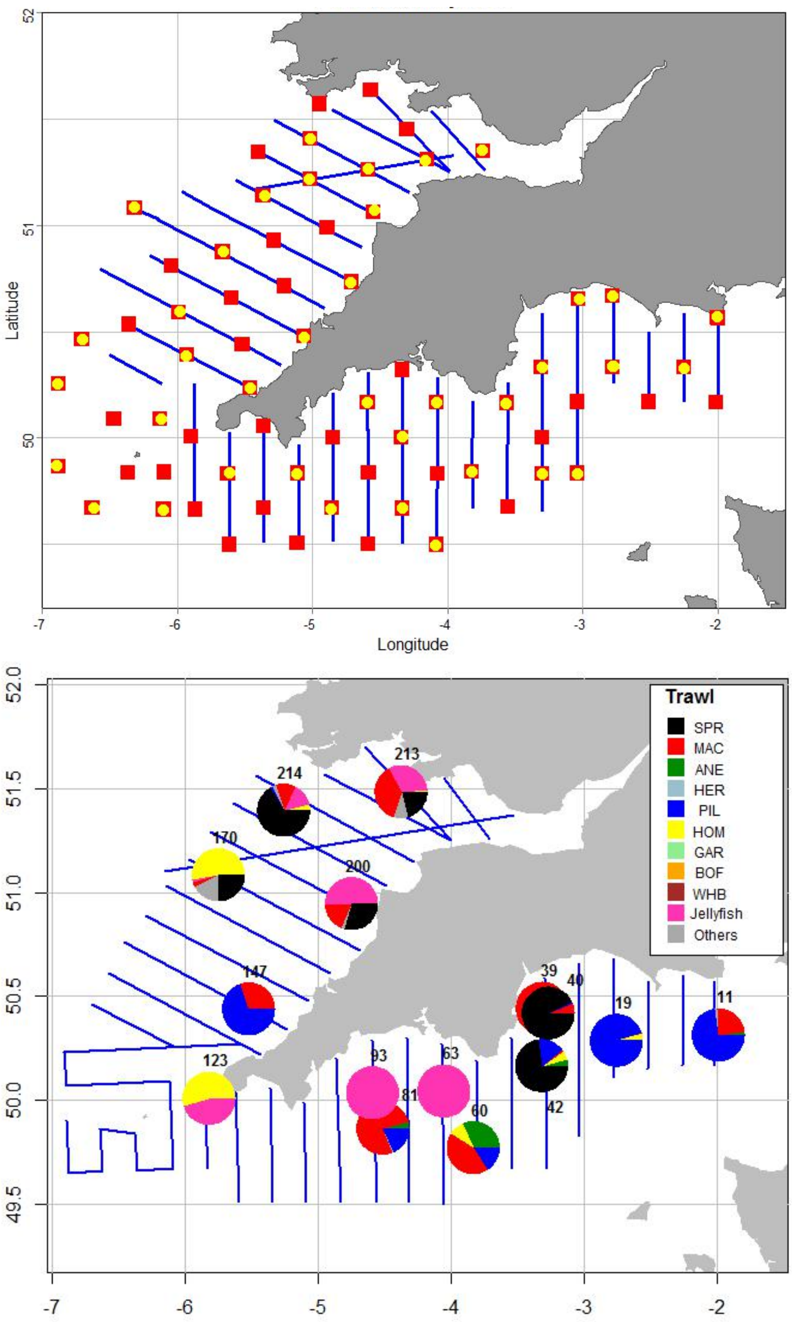


Figure 3. Overview map and detail of the survey area. Top: Acoustic transects (blue lines) and prime stations completed during PELTIC16. Bottom: Trawl catches (pies) with relative catch composition by key species. Three letter codes: SPR=sprat, MAC=mackerel, ANE=anchovy, HER=herring, PIL=sardine, HOM= horse mackerel, GAR=garfish, BOF=Boarfish, WHB=Blue whiting.

Species distribution in 2016 was comparable to those observed in previous years. Sprat dominated in western Lyme Bay and in the coastal waters of the Bristol Channel. As in previous years, sprat in the Bristol Channel consisted nearly entirely of juvenile specimens, whereas those from the Lyme Bay area were more mature although maximum size was relatively low at 14 cm (fig. 4) compared to previous years.

Sardines (*Sardina pilchardus*) were widespread as in 2015 and specimens were found in most hauls (fig. 3). As was the case in 2015, the size of specimens collected in the Bristol Channel included larger adults fish of around 19 cm although the dominant large numbers of fish of around 15cm were also found this year (Fig 4). Similar length frequency distribution was obtained from the English

Channel trawl stations. Maximum sardine size exceeded 22 cm (Fig 4) which is larger than 2015 (20) but smaller than 2014 (25 cm).

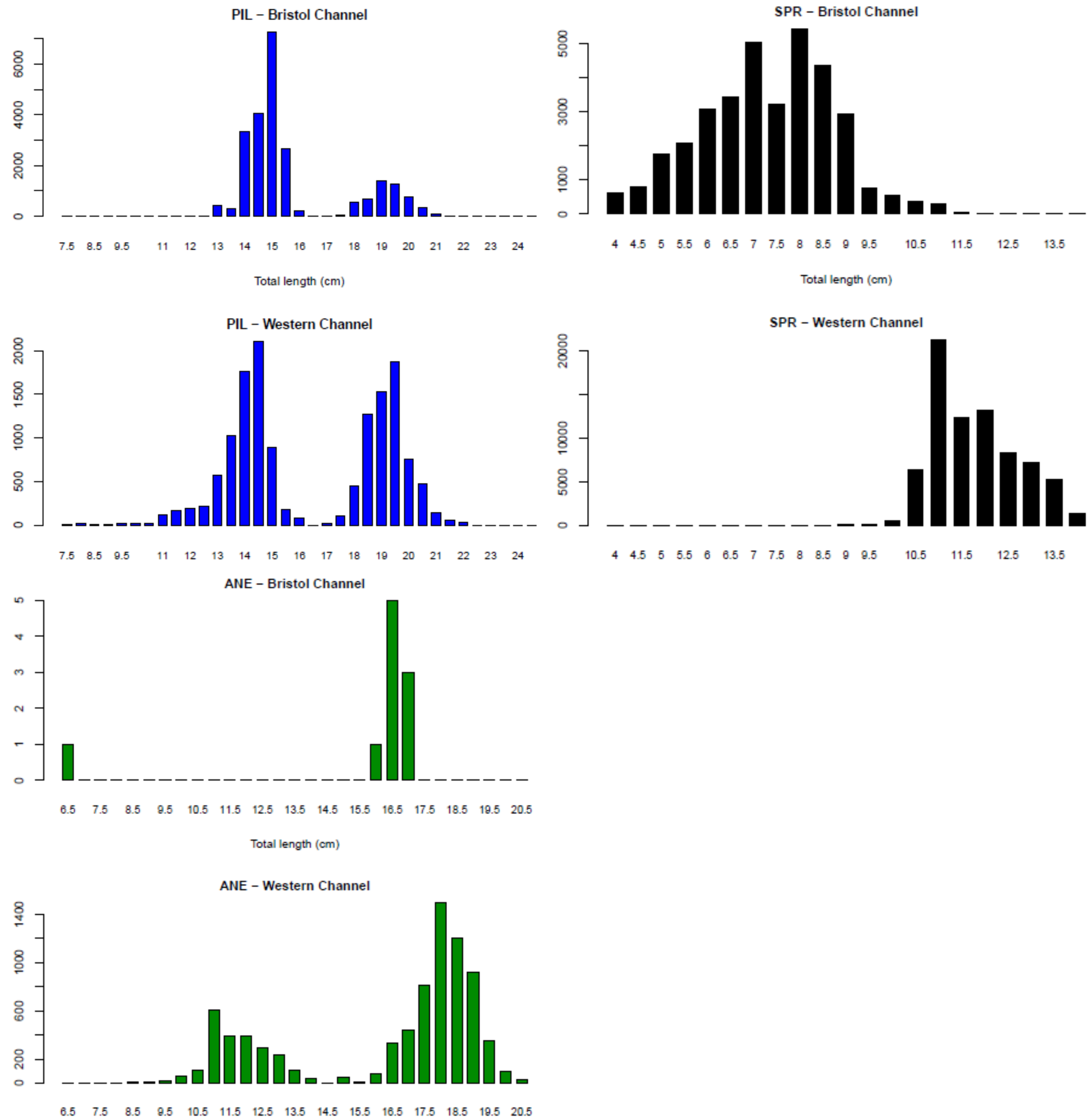


Figure 4. Trawl-caught numbers by length of sardine (*Sardina pilchardus*) (PIL, top left) sprat (*Sprattus sprattus*) (SPR, top right) and anchovy (*Engraulis encrasicolus*) by subarea. Please note that these numbers are not raised by the acoustic data.

Anchovy (*Engraulis encrasicolus*) was found in good numbers and more widespread in the Bristol Channel area. Mackerel (*Scomber scombrus*) and horse mackerel (*Trachurus trachurus*) were found widespread throughout the survey area dominated by juvenile specimens (Fig 5). Some large and relatively dense mackerel aggregations were apparent near the Celtic Deep.

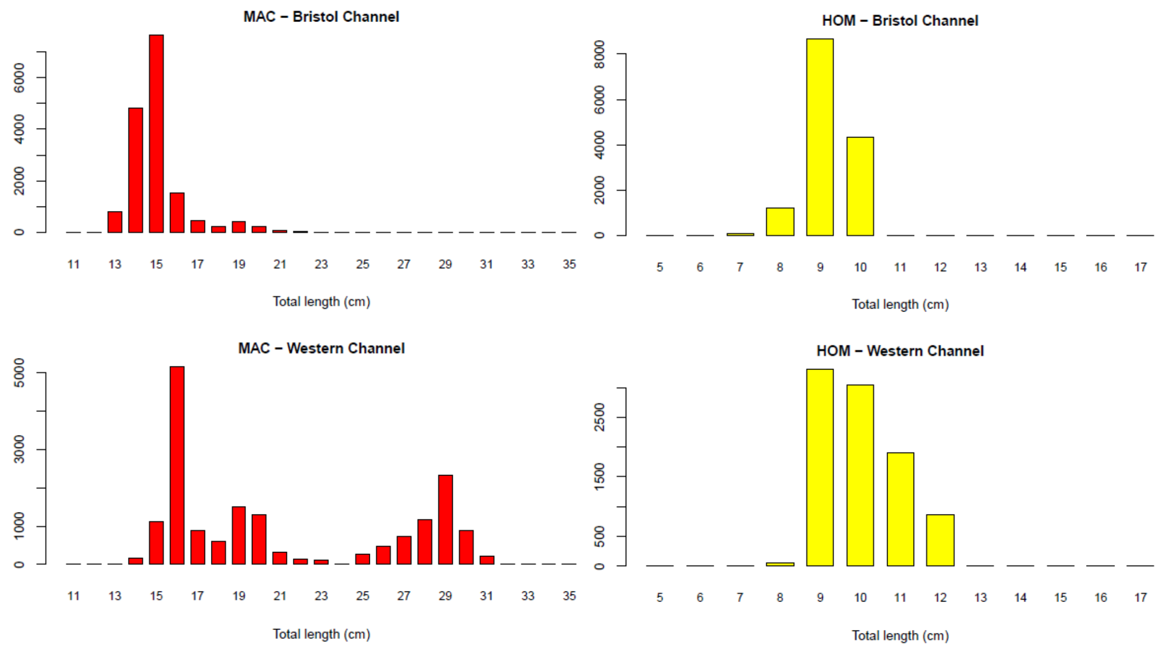


Figure 5. Trawl caught numbers by length of mackerel (MAC, left) and horse mackerel (HOM, right) in the Bristol Channel (top) and English Channel (bottom).

3.2. Plankton

3.2.1. Ichthyoplankton

Good numbers of sardine egg were found, with the highest densities in the Eddystone Bay, western Channel. As in previous years, sardine larvae were slightly more widely distributed although the highest densities were also found in Eddystone Bay. Prior to 2015, no sardine eggs had been found north of the Cornish Peninsula. In 2015 two stations contained small numbers of eggs. This year however, eggs were found at five station in the Bristol Channel and at one station in larger numbers. Sardine larvae, normally found in low numbers in the Bristol Channel, were particularly abundant on one of the offshore Bristol Channel stations (Fig 6).

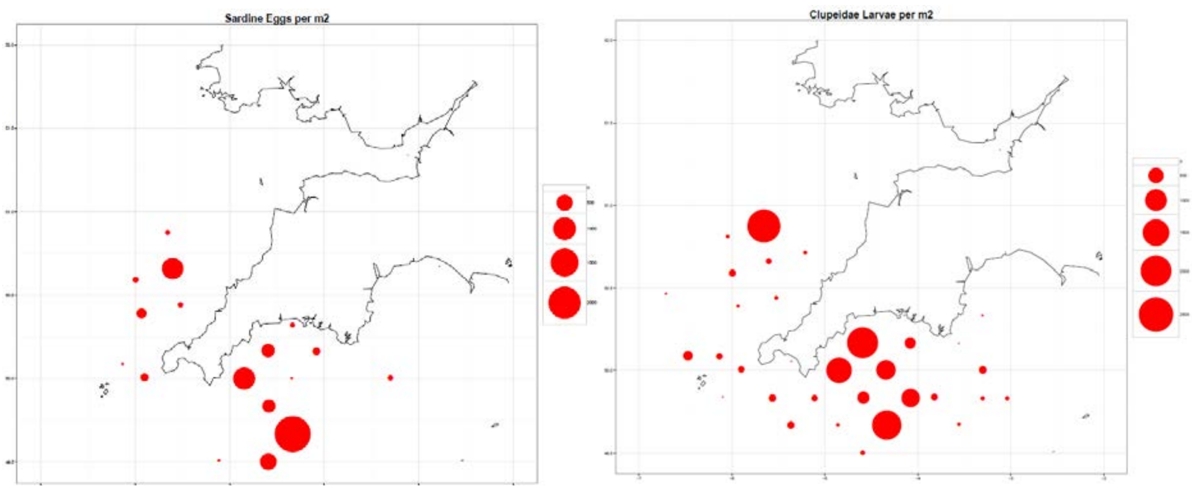


Figure 6. Sardine egg densities in m2 (left) and larvae (right) as sampled during the 2016 Peltic survey.

3.2.2. Plankton Image Analyser

PIA was successfully deployed throughout the survey, collecting over 10 million images of zooplankton throughout the sea trip. Despite the significant swell and wind conditions the system operated consistently and reliably, collecting good quality images (Fig 7 for some examples). These will be further processed and categorised back in the lab and compared with the zooscan results from the 70 Ringnet samples and from 40 CALPS stations.

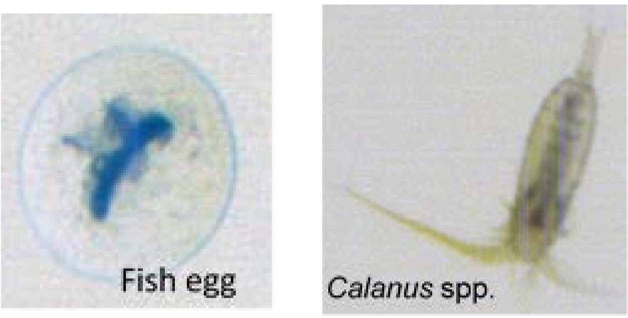


Figure 7. Examples of two images recorded during the PELTIC16 survey using the Plankton Image Analyser system.

3.3. Oceanographic data

3.3.1. Temperature and salinity

Surface waters of the Western English Channel were warmer than waters of the Celtic and Irish Seas with temperatures up to 17.13°C (from the SAIV MiniCTD; Figs 8 and 9). The maximum temperature recorded during the survey in 2016 was higher than maximum temperatures during surveys in 2013 and 2015 (approximately 16°C), but it was 1°C lower than maximum temperature recorded in 2014. Temperatures near the bottom were highest at stations in the Western English Channel and lowest at offshore stations in the Celtic Sea (down to 10.15°C; Figure 8).

Salinity was similar between the sampling stations, except at the inner stations in the Bristol Channel, which had lower salinity (33.48), as result of freshwater inputs from the River Severn. The salinity range (33.48-35.13) was comparable with ranges measured during surveys in the previous years.

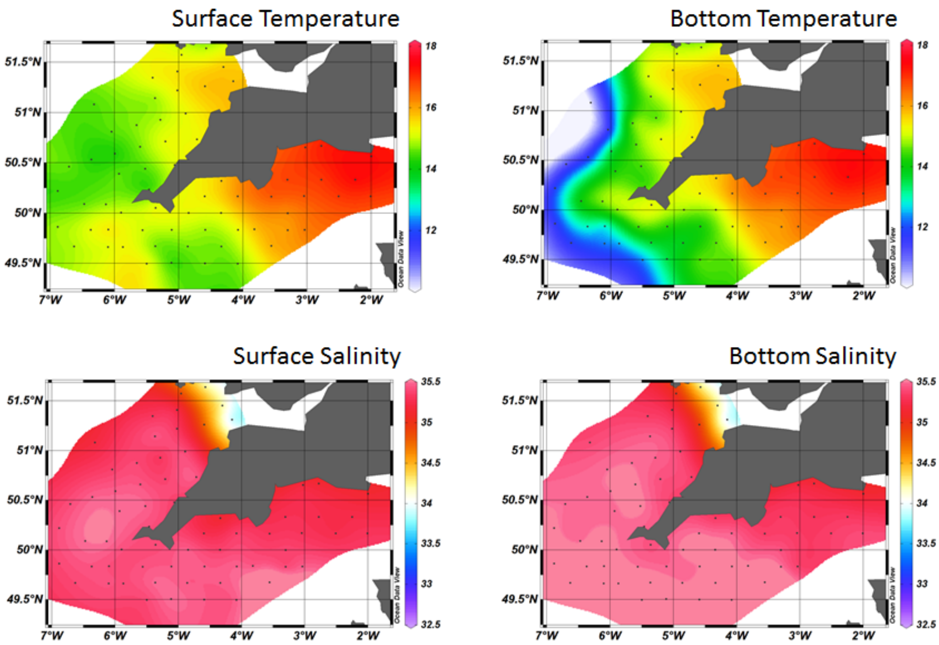
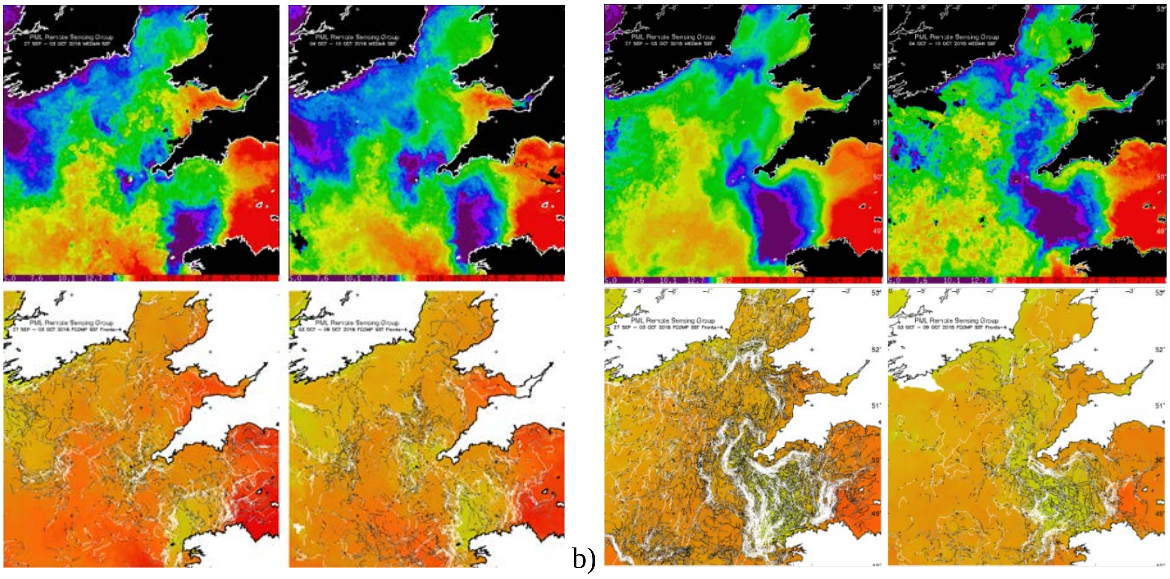


Figure 8. Temperature (°C) and salinity at the subsurface (1-2 m depth) and above the bottom measured by the SAIV MiniCTD at the 69 sampling stations between 3rd October and 19th October 2016. Maps prepared with Ocean Data View (ODW).

The patch of slightly cooler water, located south of Eddystone Bay, was clearly visible in satellite remote sensing images (Fig 9a). In comparison with images from previous years, the patch was smaller and located further south, near the France coast (compare Fig 9a and 9b). During the course of the survey the patch extended northwards, towards the Cornish coast.

The boundary layer where the patch cooler waters meet the warmer waters of the English Channel and the Celtic Sea was marked by a series of frontal systems (Fig 9a); in 2016, the fronts were located further south and appeared to be weaker than the previous year (compared Fig 9a and 9b).



a) b)

Figure 9. Composite surface maps for the periods 27 September - 3 October, 4 – 10 October 2016 (a) and 2015 (b) of temperature (upper row of images) and thermal frontal systems (lower row) from Neodaas.co.uk (PML).

The majority of stations near the Isles of Scilly, the most westerly stations of the Western English Channel and the offshore stations of the Bristol Channel area, were thermally stratified ($\Delta T > 0.5°C$), with difference in temperature between surface and bottom of up to 4.35°C (Fig 10). Distribution of the mixed/stratified areas in 2016 was similar to distribution in 2013 and 2015 (Fig 10).

Differences in surface and bottom salinity were small, suggesting that the vertical stratification of the water column was mainly driven by changes in temperature rather than salinity.

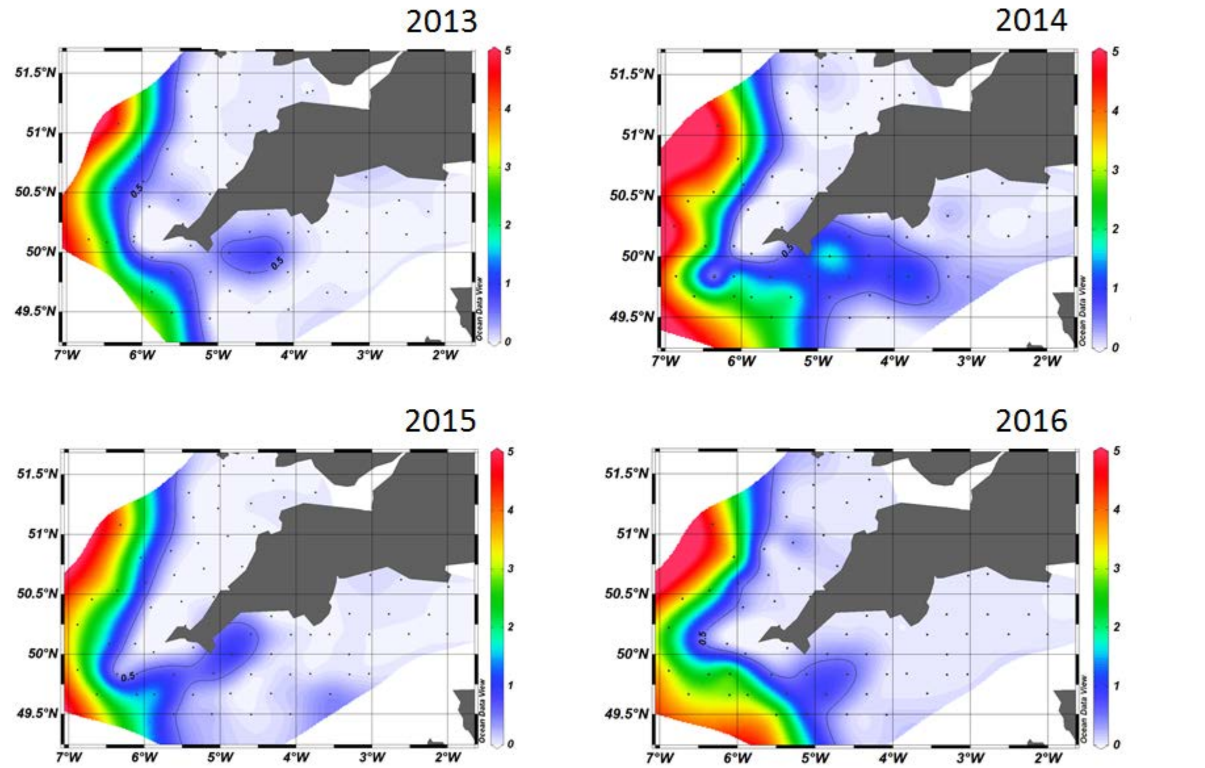


Figure 10. Values of ΔT (surface temperature – bottom temperature; °C) at the 69 sampling stations, as measured by the SAIV MiniCTD, in 2013, 2014, 2015 and 2016. The water column is considered stratified when ΔT > 0.5 (°C); ΔT = 0.5 °C is marked by the continuous black line. Maps prepared with Ocean Data View (ODW).

Differences in vertical structure of the water column between the three main areas of the Western English Channel (WEC), Isles of Scilly (SI) and Bristol Channel (BC) were observed (Fig 11, based on measurements by the Rosette SeaBird CTD). WEC and BC had the highest temperatures and were fully mixed; BC had the lowest salinity and the highest turbidity (Fig 11). Offshore stations showed thermal stratification, with cooler water near the bottom, except at station prime 27 (indicated with a '*' in Fig 11) where the cooler water reached the mid-water column. Interestingly, this latter station also presented a Deep Chlorophyll Maximum (Fig 11 – Fluorescence Seapoint).

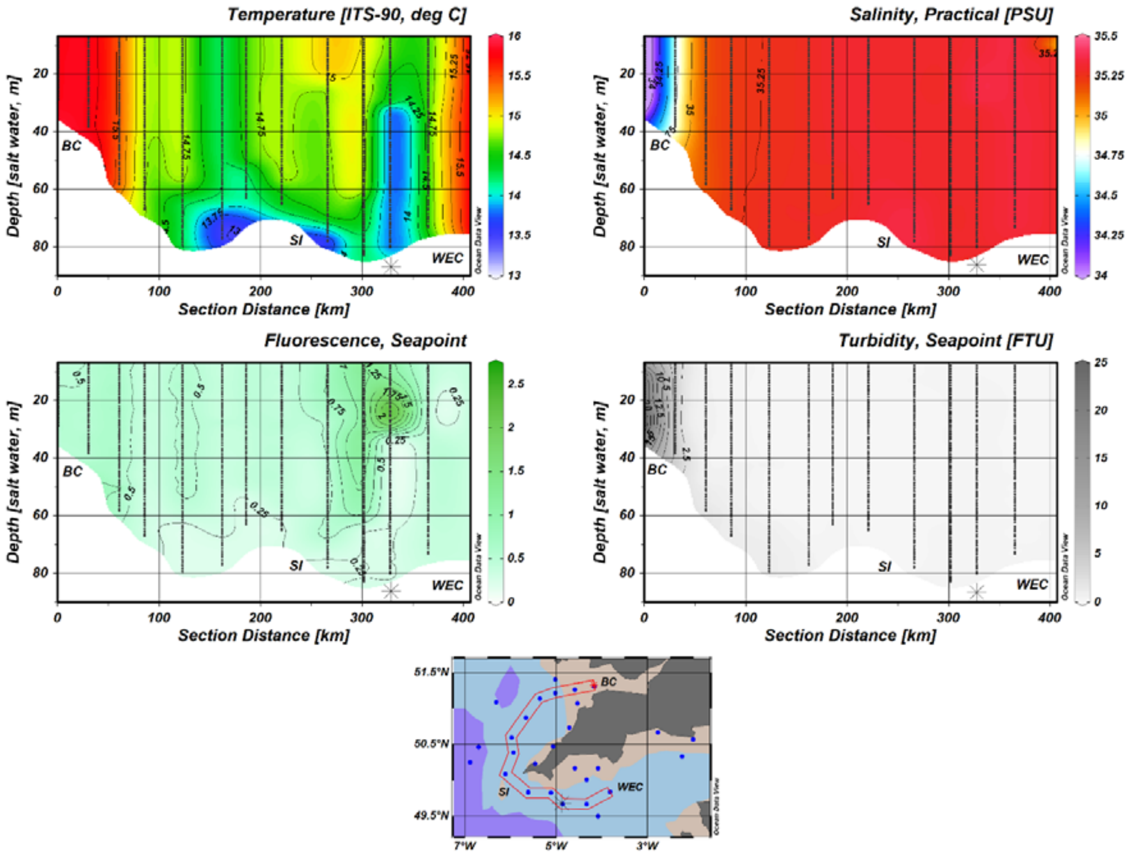


Figure 11. Section from Western English Channel (WEC), to the Bristol Channel (BC), passing through the Scilly Isles (SI), prepared combining temperature, salinity, fluorescence and turbidity profiles collected with the SeaBird on the Rosette sampler. Prime station 27, characterised by a Deep Chlorophyll Maximum (DCM) is indicated with a star '*'. Maps prepared with Ocean Data View (ODW).

3.3.2. Fluorescence and chlorophyll concentration

Remote sensing techniques showed that surface chlorophyll concentration at the end of September were highest south of the Cornish coast (in the middle of the Western English Channel) and offshore near the Isles Scilly (Fig 12). In situ measurements of surface fluorescence showed that higher levels of chlorophyll were observed south of Lizard Point (Fig 13, from Ferrybox measurements).

Furthermore, the satellite images of surface chlorophyll (Fig 12) also suggested high level of chlorophyll concentration in the Bristol Channel; this observation was not supported by the Ferrybox and SeaBird CTD fluorescence measurements which were generally low in the Bristol Channel area (Fig 11 and 13). This could be explained by the higher level of suspended solids in the inner Bristol Channel (see Fig 11 – Turbidity Seapoint [FTU] transect) affecting the reliability of the remote sensing algorithm for calculating chlorophyll concentration.

Chlorophyll concentration (expressed as fluorescence) at the 18 sampling stations was generally constant throughout the surface mixed layer, with exception of prime station 27 (in yellow in Fig 14), which showed the presence of a Deep Chlorophyll Maximum (DCM) at around 20 m depth. DCM are normally observed in seasonally stratified water column during summer. In the summer months the surface mixed layer is nutrient depleted while nutrients are 'locked' below the thermocline in the bottom layer. As the light level is low below the thermocline, phytoplankton is not able to utilize the available nutrients. However, just above the thermocline the light level is sufficient for phytoplankton to utilize the dissolved nutrients, resulting in a maximum of chlorophyll at depth. During the autumn, with the breaking of the vertical stratification, the inorganic nutrients are released throughout the water column, potentially leading to an autumn bloom.

Analysis in the laboratory of phytoplankton samples will provide details of the pico-, nano- and micro-phytoplankton community as well as their abundance and pigment composition.

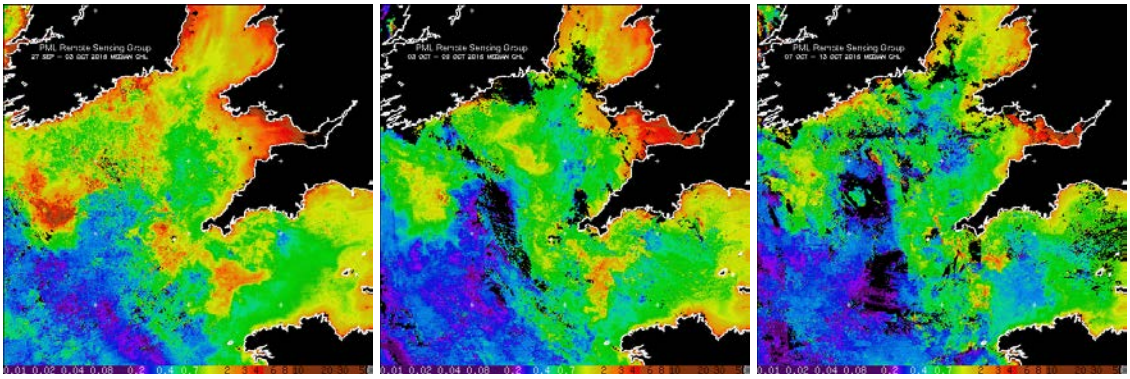


Figure 12. Composite surface maps of chlorophyll, OC3 algorithm, for periods 27 September - 3 October, 4 – 10 October, 7 – 13 October (left to right), from Neodaas.co.uk (PML).

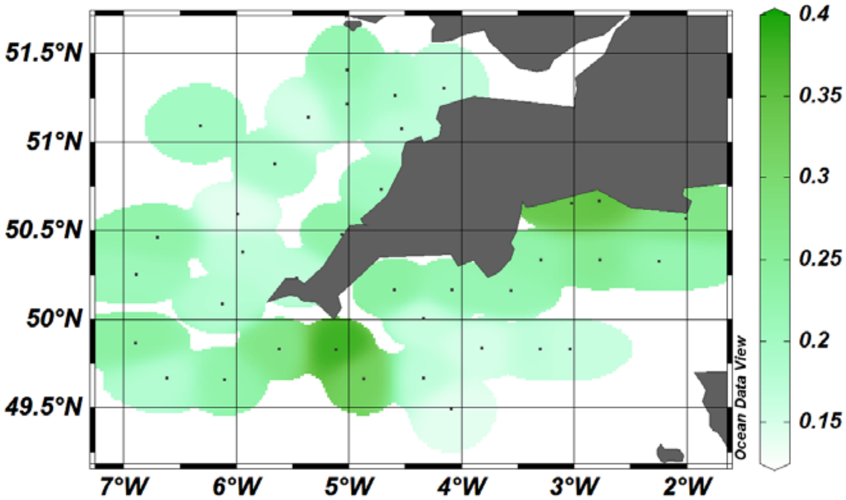


Figure 13. Fluorescence values at 4 m depth, at 18 sampling stations, as recorded by the Ferrybox. Maps prepared with Ocean Data View (ODW).

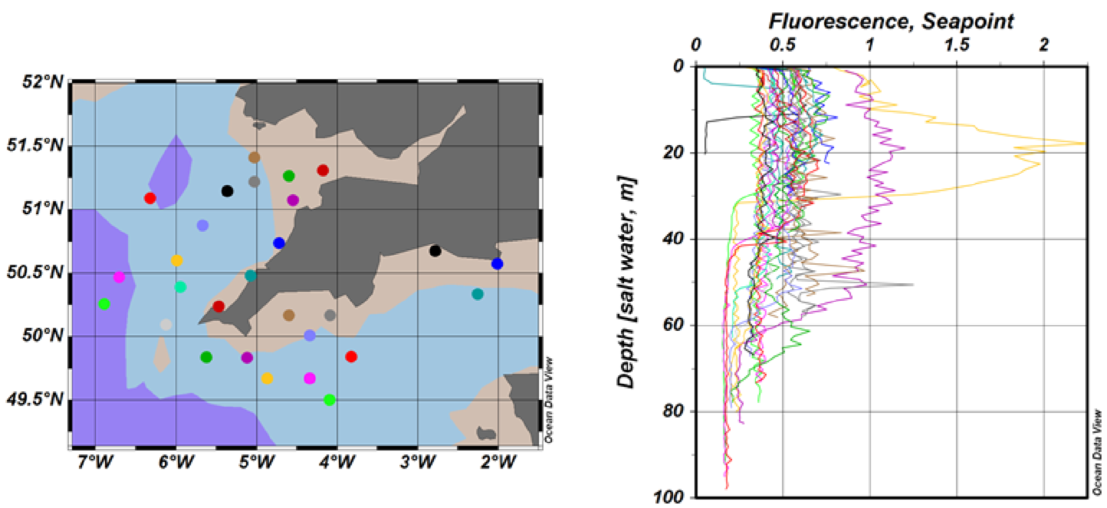


Figure 14. Fluorescence profiles at 18 sampling stations, as recorded by the SeaBird CTD mounted on the Rosette sampler. Maps prepared with Ocean Data View (ODW).

3.4. Marine Mammals and birds

Whilst a full analysis of the data has not yet been conducted, a superficial summary of species recorded by the two teams follows. Please note that due to the different methodologies used and the different times during which incidental records were logged, these totals from the two teams are not comparable. Some of the birds included in these totals may have been recorded by both teams simultaneously whilst others may not.

Bird species recorded (58 species in total):
Of significant note, the total number of Balearic Shearwater *Puffinus mauretanicus* seen was a minimum of 99 (subject to analysis of the two data sets recorded), with notable concentrations to the west of Lundy island, Devon. Behaviours noted include shallow plunge diving, surface pecking and active searching, particularly around the RV Endeavour’s wake during one notable net retrieval. Numbers of Fulmar *Fulmarus galcialis* were very low this year.

Some evidence of visible migration was noted, particularly along the Dorset coast, with a steady stream of Meadow Pipits *Anthus pratensis* and Barn Swallow *Hirundo rustica* overhead. Additionally, a small variety of species were observed on board or attempting to land on board the survey vessel. Perhaps surprisingly, considering the challenging weather conditions, none of these required rehabilitation this year and all left the vessel of their own accord. The Long-tailed Skua *Stercorarius longicaudus* was arguably the highlight, but a migrating ring-tailed Hen Harrier *Circus cyaneus* and Hawfinch *Coccothraustes coccothraustes* also stand out as most unexpected species recorded. No rare vagrants were seen this year most likely due to the position of the weather systems.

Cetacean species recorded:
Animals were only recorded in transect by each team if they entered the respective transect. Any animals seen outside of this were recorded as out of transect. There were fewer sightings this year compared to last, arguably due to the poor sea state and weather. Most noticeably this affected the number of Harbour Porpoise *Phocoena phocoena* detected with only 6 animals seen. The Long-finned Pilot Whale *Globicephala melas* were found south of Plymouth and the Fin Whale *Balaenoptera physalus* were located to the north west of the Cornwall and Devon coasts, although they were a little further into the Celtic Deep than last year. No White-beaked Dolphin *Lagenorhynchus albirostris* were seen this year.

Fish species recorded:
Atlantic Bluefin Tuna *Thunnus thynnus* were seen by the ESAS observers at 6 different locations, scattered around the Dorset, Devon and Cornwall waters. Frustratingly however the fish never remained active after first detection so no photographs were taken. A further 7th separate observation was made by the MarineLife observer.

The most unusual species recorded was a Gem moth *Nycterosea obstipata* found in the garage area of the vessel by one of the fish scientists, having landed onboard overnight on 10 October. This is a rare migrant moth but several were found by lepidopterists along the south coast during this week so it is far from unprecedented.

4. Summary

The fifth in the series of Pelagic Ecosystem Surveys in the western English Channel and Eastern Celtic Sea took place between the 3rd and 19th of October 2016. The oceanographic conditions were similar to those observed in 2014 and represented a relatively warm autumn bloom scenario, in contrast to the more typical 2013 and 2015 condition and the winter conditions encountered in 2012. Primary production was relatively low, and was observed near the strong frontal systems particularly those around a cool water pool off the southwest of Cornwall.

Preliminary results on the small pelagic fish community suggested that most species were doing well apart from sprat. Few sprat schools were observed in Lyme Bay and also the offshore schools in deep waters of the Bristol Channel in 2015 were no present in the survey area. As has been observed in previous years, sprat in the western Channel consisted of predominantly adult specimens (age 1-3), compared to in-and offshore sprat in the Bristol Channel which were predominantly age 0 (with a unimodal length distribution around 8 cm).

Anchovy was found in large numbers in the western English Channel, extending further west as was the case in 2015. Noticeably in this area were the larger number of older specimens than in previous years. Anchovy was also observed in the Bristol Channel, including some larger specimens.

Good sardine numbers were found and their distribution was widespread. They were present in most trawl hauls conducted in the western channel. Distribution here was only limited, it seems, by the cold water pool that was situated south off the western tip of the Cornish Peninsula. In the Bristol Channel sardine appeared to be concentrated to the middle of the transects, between the deeper and very shallowest parts, apparently associated with prevailing frontal systems. Sardine spawning (based on egg distribution) was similar to in 2014 and 2015 both in terms of magnitude and distribution although for the second consecutive year eggs were observed in the Bristol Channel and in good numbers.

Mackerel were observed throughout the survey area, both in and offshore, although particular areas contained higher densities, most noticeably around the Celtic Deep. Young of the year made up the majority although older specimens were also found. Horse mackerel were prevalent in the survey area although they dominated the offshore areas of the western Channel and around the Isles of Scilly. Unlike previously the length data showed unimodal distribution around 9 cm which was generally associated with 0-year old fish.

One of the most notable observations were the seven separate feeding aggregations of blue fin tuna along the coast; the only other time one this species was observed during the 5 year time series was in the other hot year (2014).

Annex 5f: International Herring Larvae Surveys (IHLS)

1 International herring larvae surveys

1.1 Review of larvae surveys in 2016

1.1.1 North Sea

The main spawning grounds of North Sea autumn spawning herring are monitored annually in the International herring larvae surveys. They are treated as four sub areas (Orkney/Shetlands, Buchan, Central North Sea and Southern North Sea). The first two sub areas should be sampled twice, the last two sub areas three times during the spawning season in different half month intervals (Table 5f.1). The standard gear is a GULF III or GULF VII sampler and stations are approximately 10 nautical miles apart.

The abundance of newly hatched larvae (less than 10 mm total length; 11 mm for the Southern North Sea) is used as the basis for the index calculation. To estimate larval abundance, the mean number of larvae per square meter as obtained from the ichthyoplankton hauls is raised to rectangles of 30x30 nautical miles and the corresponding surface area. These values are summed up within the given sub area and provide the larval abundance per sub area for one interval.

However, since the middle of the 1990s, survey participation and effort is too low to monitor the whole spawning season. In the last two decades, almost only the Netherlands and Germany participated in the herring larvae surveys.

The herring larvae sampling period is still in progress at the time of the WGIPS meeting in January. Due to severe technical breakdown of the research vessel scheduled for the German survey in September around the Orkney, the cruise had to be cancelled. The time remaining was too short to get everything arranged when trying to charter a vessel. However, since the technical problems persisted over a longer period, a charter vessel was used in the German survey in January 2017.

So far, five units and time periods out of ten will be covered in the 2016/17 period, as given below.

Table 5f.1: Areas and time periods covered during the 2016/2017 herring larvae surveys:

Area / Period	1–15 September	16–30 September	1–15 October
Orkney / Shetland	--	cancelled	
Buchan	--	Netherlands	
Central North Sea	--	Netherlands	--
	16–31 December	1–15 January	16–31 January
Southern North Sea	Netherlands	Germany	Netherlands

For most of the herring larvae surveys in the North Sea, sample examination and larvae measurements have not yet been completed; therefore, it is not possible to give an overview on the final survey results. Figure 5f.1 shows the herring larvae distribution as obtained by the German survey in the English Channel in the beginning of January 2017.

As in previous years, the available information will be summarized and presented at the Herring Assessment Working Group (HAWG) meeting in March 2017.

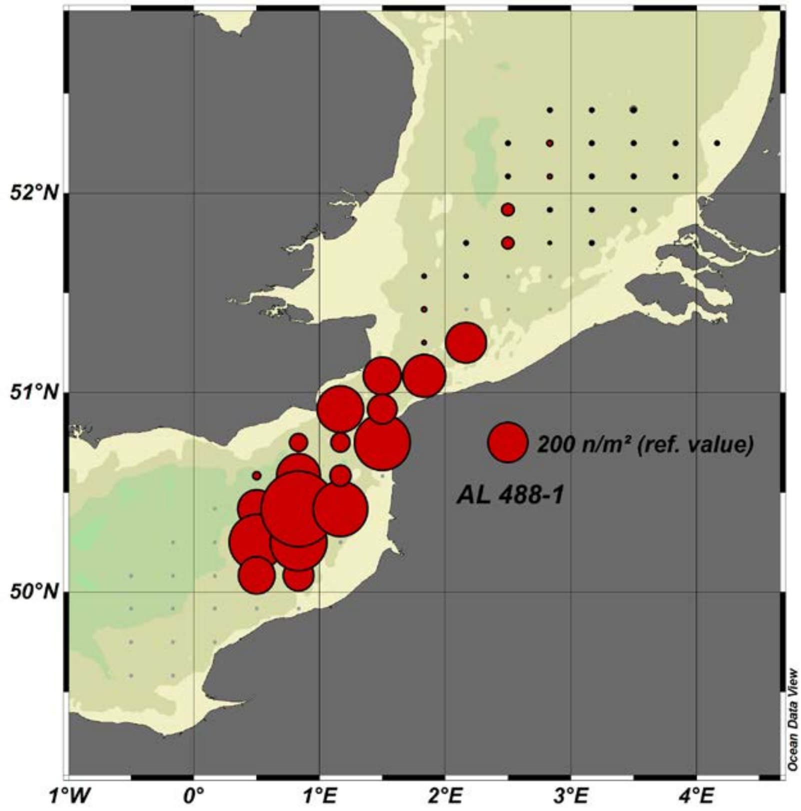


Figure 5f.1: Abundance of herring larvae per square metre (all sizes, n/m²), as obtained by the German survey in the English Channel and Southern North Sea (first half of January 2017). The symbol size is equal to 200 larvae per square metre. AL 488-1 refers to the national cruise number.

1.2 Coordination of herring larvae surveys in the North Sea in 2017

At the time of the WGIPS meeting, only the participation of the Netherlands and Germany is confirmed for the next herring larvae survey period in the North Sea. Due to limitations in available ship time, none of the areas will be covered neither in the first half of September nor in October. Sampling will be done in the second half of September by Germany in the Orkney/Shetland area and by the Netherlands in the Buchan area and the Central North Sea. The whole spawning activity of Downs herring will be monitored in three surveys from the middle of December 2017 to the end of January 2018. A preliminary timetable for the next sampling period is presented as follows:

Table 5f.2: Areas and time periods for the 2017 herring larvae surveys:

Area / Period	1-15 September	16-30 September	1-15 October
Orkney / Shetland	--	Germany	
Buchan	--	Netherlands	
Central North Sea	--	Netherlands	--
	16-31 December	**1-15 January**	**16-31 January**
Southern North Sea	Netherlands	Germany	Netherlands

1.2.1 Irish Sea

Herring larvae surveys of the northern Irish Sea (ICES area VIIaN) have been carried out by the Agri-Food and Biosciences Institute (AFBI), formerly the Department of Agriculture and Rural Development for Northern Ireland (DARD), in November each year since 1993. The surveys have been carried out onboard the RV "Corystes" since 2005, and prior to that on the smaller RV "Lough Foyle".

Sampling is carried out on a systematic grid of stations covering the spawning grounds and surrounding regions in the NE and NW Irish Sea (Figure 3.1.3.1). Larvae are sampled using a Gulf-VII high-speed plankton sampler with 280 µm net. Mean catch-rates (nos.m-2) are calculated over stations to give separate indices of abundance for the NE and NW Irish Sea. Larval production rates (standardized to a larva of 6 mm), and birthdate distributions, are computed based on the mean density of larvae by length class.

A growth-rate of 0.35 mm day-1 and instantaneous mortality of 0.14 day-1 are assumed based on estimates made in 1993–1997.

The 2016 survey was successfully completed in fair to moderate weather conditions, resulting in a total of 63 stations sampled (Figure 5f.3). The spatial distribution of herring larvae was similar to previous years, with larvae distributed to the north of the Isle of Man and Douglas bank regions. Larvae were also located to the west of the Isle of Man mainly associated with more coastal stations, suggestive of dispersal via local currents. A particularly high abundance of newly hatched larvae (yolk sacs evident) was located over the Douglas bank spawning area.

The point estimate of production in the north eastern Irish Sea for 2016 (1.09 x 1012 larvae) remains below the time series mean (Figure 5f.2). While larvae abundances were high in discrete areas the small size and early age of larvae meant that these high abundances did not translated to a high production index. The index is used as an indicator of spawning-stock biomass in the assessment of Irish Sea herring by the Herring Assessment Working Group (HAWG).

The 2017 survey is scheduled to take place 6th – 12th November.

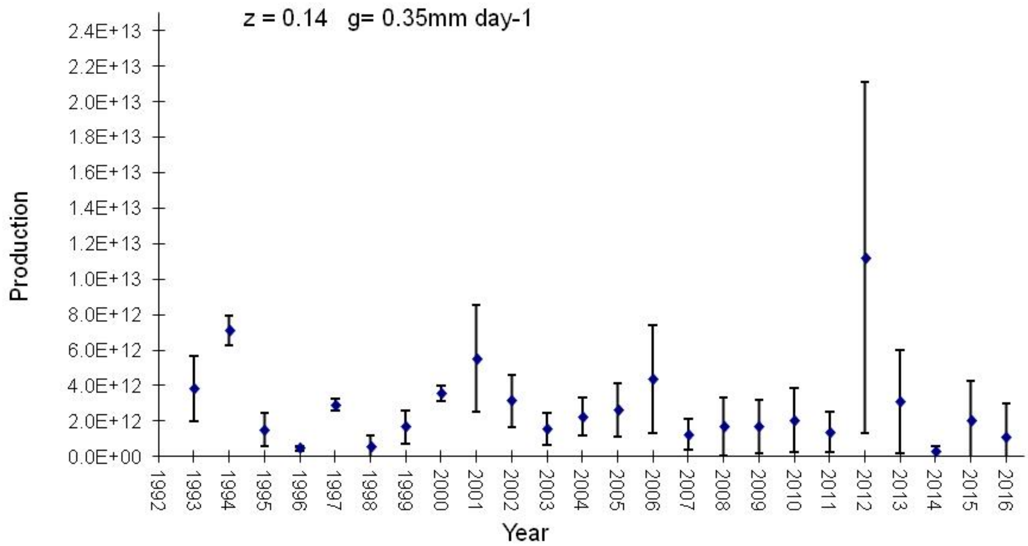


Figure 5f.2: Estimates of larval herring production in the north eastern Irish Sea from 1993 to 2016. Error bars denote 1 standard error (calculated from coefficients of variation of the estimates of abundance, but not including uncertainty in growth or mortality).

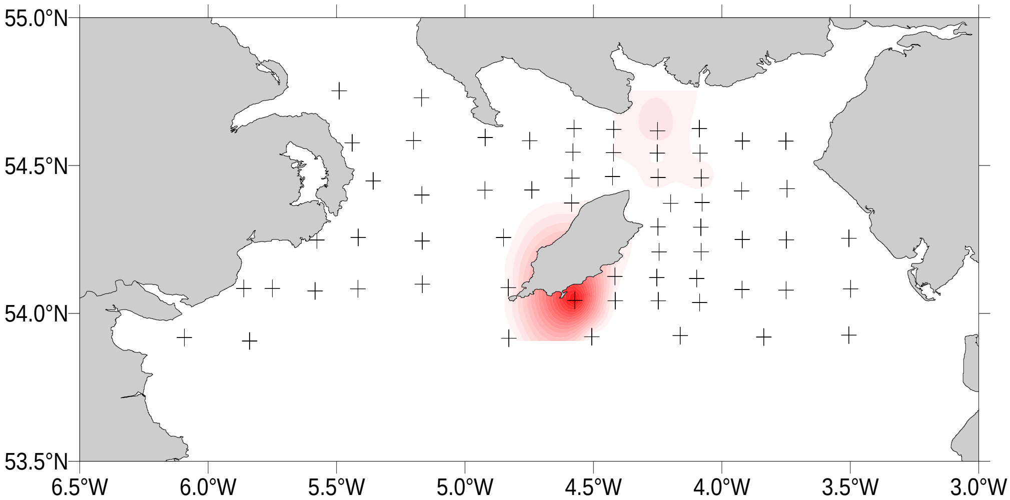


Figure 5f.3: Estimates of larval herring abundance in the northern Irish Sea in 2016. Crosses mark sampling stations. Intensity of shading is proportional to larva abundance (maximum = 984 per m2).

Annex 5g: 6a Survey

Planning and results of the 2016 industry-science acoustic survey of herring in the Western British Isles (ICES div 6a, 7bc)

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Zephyr (Allister Irvine), Wiron 5&6 (Jan Melis/ Adrie Hoek), Quantus (Mark Buchan), Unity (Stephen Bellany), Atlantic Challenge (Stevie McSharry), Annie Hillina (Henk Krijgsman),

(Version: 0.4: 6/03/2017)

Contents

Summary

Overview of this year's survey

This year (2016) was the first industry-led acoustic survey of herring in 6a/7bc. Three industry vessels were used in the 6aN, two vessels had EK60 mounted on a towed body, the other vessel used an EK80 transceiver with the ships transducer. Each vessel was calibrated and dedicated to undertake an acoustic survey in a specific pre-spawning/ spawning area and undertaken to coincide with the spawning period. In 6aS/7bc, one industry vessel with scientific EK60 transceivers and calibrated hull mounted transducers (38 and 120kHz) was used to conduct the survey encompassing the majority of spawning areas in 6aS and some in 7b. In this area, the herring were close inshore during the survey and therefore full containment of the stock was not achieved. Sea state was generally calm and acoustic data were successfully recorded from all vessels, along with biological data from sample hauls.

Survey component	**6aN**	**6aS/7bc**
Survey design	3nmi spacing, covering predefined spawning areas. Calibrated sounders on industry vessels	3nmi spacing, covering the main 6aS/7bc spawning areas. Calibrated sounders on industry vessel
Index calculation method	Age dis-aggregated using StoX software	Age dis-aggregated using StoX software
Random/Systematic error issues		
Specific survey error issues (acoustic):		Inshore containment of the stock was not achieved. Estimates rely strongly on a few large schools (e.g. Lough Swilly)
Bias considerations		
• **Bubble sweep down**	NA	NA
• **Extinction (shadowing)**	NA	Particularly on large schools
• **Blind zone**	NA	NA
• **Dead zone**	NA	Some schools were close to bottom
• **Allocation of backscatter to species**	Following scrutinisation procedure	Following scrutinisation procedure
• **Target strength**	Using ICES published TS for herring at 38KHz. TS(L) = 20log10(L) -71.2).	Using ICES published TS for herring at 38KHz TS(L) = 20log10(L) -71.2).
• **Calibration**	Calibrated following standard procedures. (SIMRAD 2003).	Calibrated following standard procedures (SIMRAD 2003).

1 Rationale, aim and objectives

1.1 Rationale

During the ICES benchmark workshop on herring west of the British Isles (ICES 2015a), the stock assessments of 6aN herring and 6aS/7bc herring (Figure 1) were merged into one combined assessment. The reason for this is that the summer acoustic surveys and fishery occur at a time when the northern and southern components are mixed, and the baseline morphometric information required to separate the two components was found to be unreliable due to evidence of changes over time. The consequence was that ICES advised a zero TAC in 2015 and 2016, and recommended that a rebuilding plan be developed. The ICES HAWG also stated in its March 2015 report that there is a clear need to determine the relative stock sizes (ICES 2015b).

Under the auspices of the Pelagic Advisory Council, this situation catalysed fishing industry associations representing Scottish, English, Dutch, Irish and German fishery interests to set about providing the much needed evidence required to establish reliable stock assessments for the separate stocks, and develop a rebuilding plan.

In response to the STECF 2015 autumn plenary recommendation that it would be beneficial to maintain an uninterrupted time series of fishery-dependent catch data, and a subsequent special request (to ICES) by the European Commission, ICES provided advice on methods for undertaking a scientific monitoring fishery for the purpose of obtaining relevant data for assessment (ICES April 2016). In particular, the advice referred to collection of data necessary to determine the identity and structure of the two stocks, collected in a way that (i) satisfies standard length, age, and reproductive monitoring purposes by EU Member States for ICES, and (ii) ensures that sufficient spawning-specific samples are available for morphometric and genetic analyses as agreed by the Pelagic Advisory Council monitoring scheme 2016 (Pelagic Advisory Council, 2016).

This advice, and a resulting EU Council regulation (EU 2016/0203) that made provision for a scientific monitoring TAC were the enablers for the industry-led survey to take place.

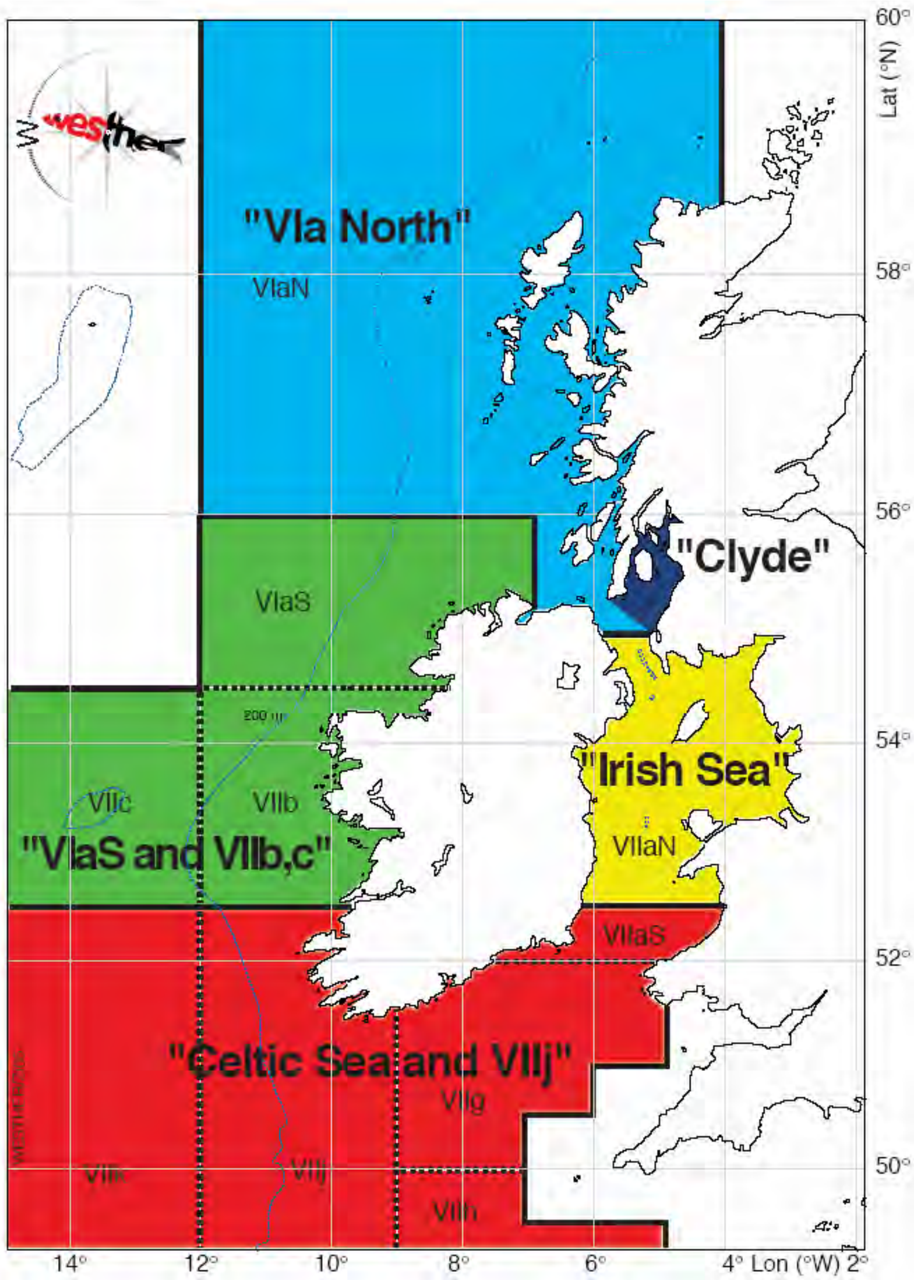


Figure 1. Herring stock assessment areas.

1.2 Overall Aim

To improve the knowledge base for the spawning components of herring in 6aN and 6aS/7bc, and submit relevant data to ICES to assist in assessing the herring stocks and contribute to establishing a rebuilding plan.

1.3 Objectives

In this report, only information on the methods and results pertaining to objective 1 are documented. A full survey report is available on request.

1. **Abundance estimation**: Collect acoustic data and information on the size and age of herring and use it to generate an age age-disaggregated acoustic estimate of the biomass of pre-spawning/ spawning components of herring in 6aN and 6aS/7bc ('Western herring').
2. **Stock identity separation:** Collect morphometric and genetic data to distinguish whether the 6aN stocks are different from the stocks in 6aS, 7bc.
3. **Age composition of the commercial catch:** Collect catch-at-age data from the monitoring fishery to provide continuous fishery-dependent time series required for assessment.

2 Material and methods

2.1 Research plan

The overall research plan involves the planning, implementation and analysis & reporting stages outlined in Figure 2.

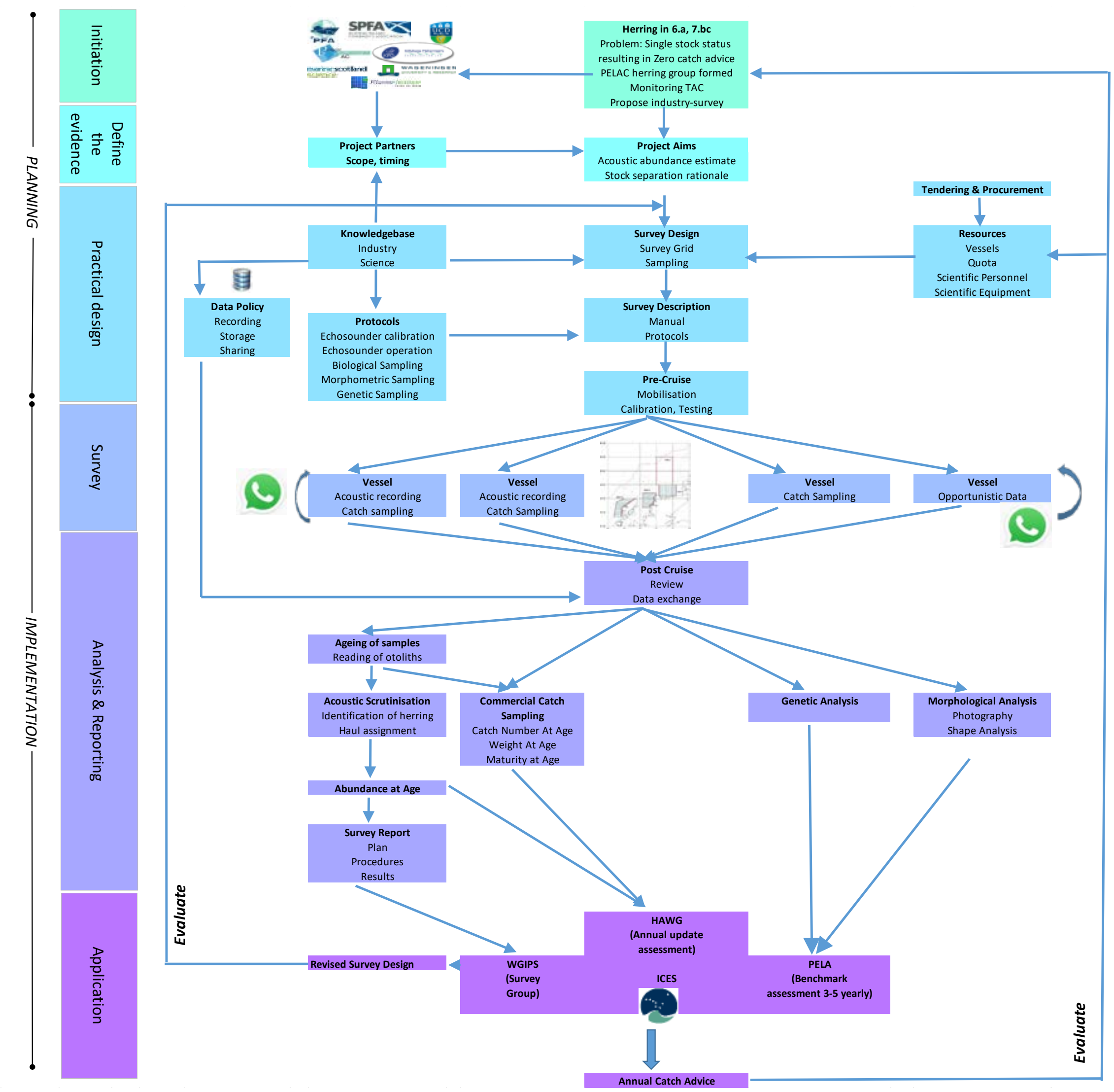


Figure 2. Overview of the planning, implementation and analysis stages in the Western herring surveys.

2.1.1 Specific survey objectives

Specific objectives for the field surveys followed objectives 1-3, described in section 1.3. Each of the 6 vessels involved were assigned specific objectives and provided with a vessel-specific survey manual describing the aims, methods and protocols (example in Annex 1). Sections 2.2 to 2.4 describe the survey methods in detail.

2.1.2 Survey areas

Utilising ICES advice on the monitoring fishery (ICES 2016), four areas were selected for surveying in 6aN (Figure 3). The limits of each area were defined by the geographic distribution of known active herring spawning areas (Figure 4) and records of commercial catches (Figure 5). Areas 2-4 are considered to be active spawning areas and Area 1 a pre-spawning aggregation area that contains an unknown mixture of stocks of Western and potentially North Sea herring, where a large proportion of catches has been taken in recent years (ICES 2016). Acoustic surveys (see section 2.2) were conducted only in areas 2-4 in 6aN.

In 6aS, 7bc, the acoustic survey area (Figure 6) collected data from known spawning areas (Figure 7). Spawning time in this area is variable, generally between October and February (Table 1).

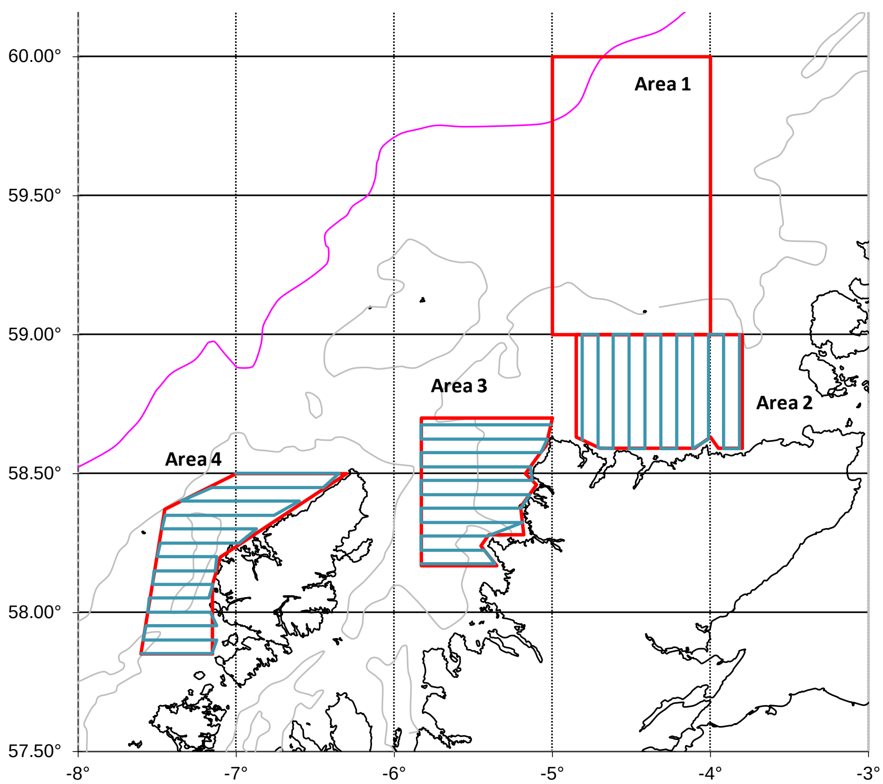


Figure 3. Limits of survey areas used in the 6aNorth surveys. Area 1- North pre-spawning mixing area, Area 2 -North mainland, Area 3 – The Minch, Area 4 – Outer Hebrides.

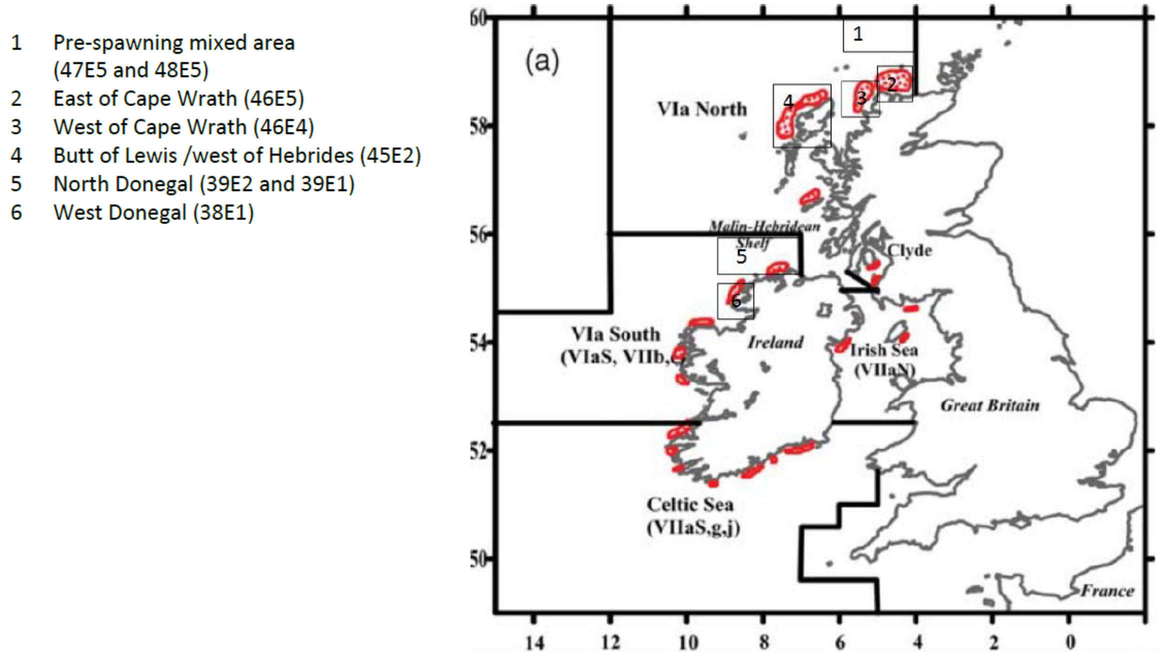


Figure 4. Spawning areas for herring in ICES subareas 6 and 7, with currently active spawning areas and pre-spawning aggregation areas for each stock indicated by black rectangles. Used in ICES 2016, redrawn from Geffen *et al.* (2011).

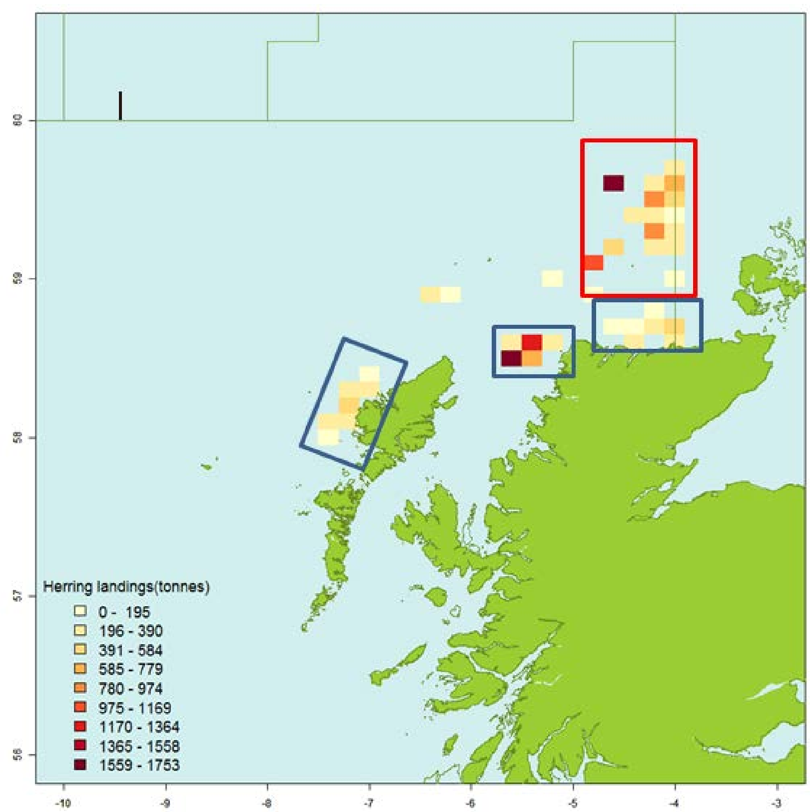


Figure 5. Distribution of commercial catches reported in 6aN.

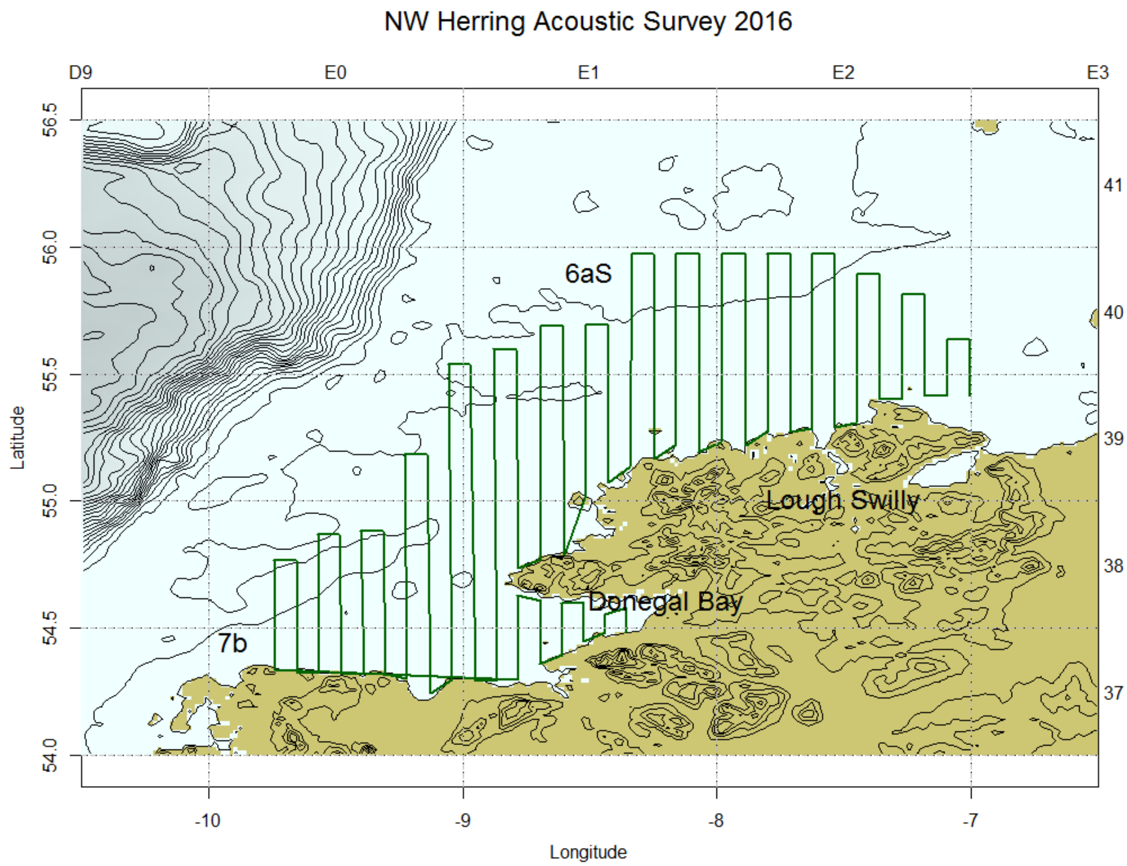


Figure 6. Acoustic survey area and transects for 6aS/7b,c in 2016. The survey was exclusively in Irish waters, approximately up to the 56˚N line in the north and 7˚W line in the east. To the west, the survey was bounded approximately by the 100m depth contour. The total transect length was 1575nmi (start 55˚24N and 7˚0W, progress west) with 3nmi separation between transects. An additional zig-zag survey track was completed in Lough Swilly, using the deepest part of the channel as the centreline for the strata area. 500m either side of this centre line was delineated as the boundary area; zig-zag transects were then placed within the strata boundaries.

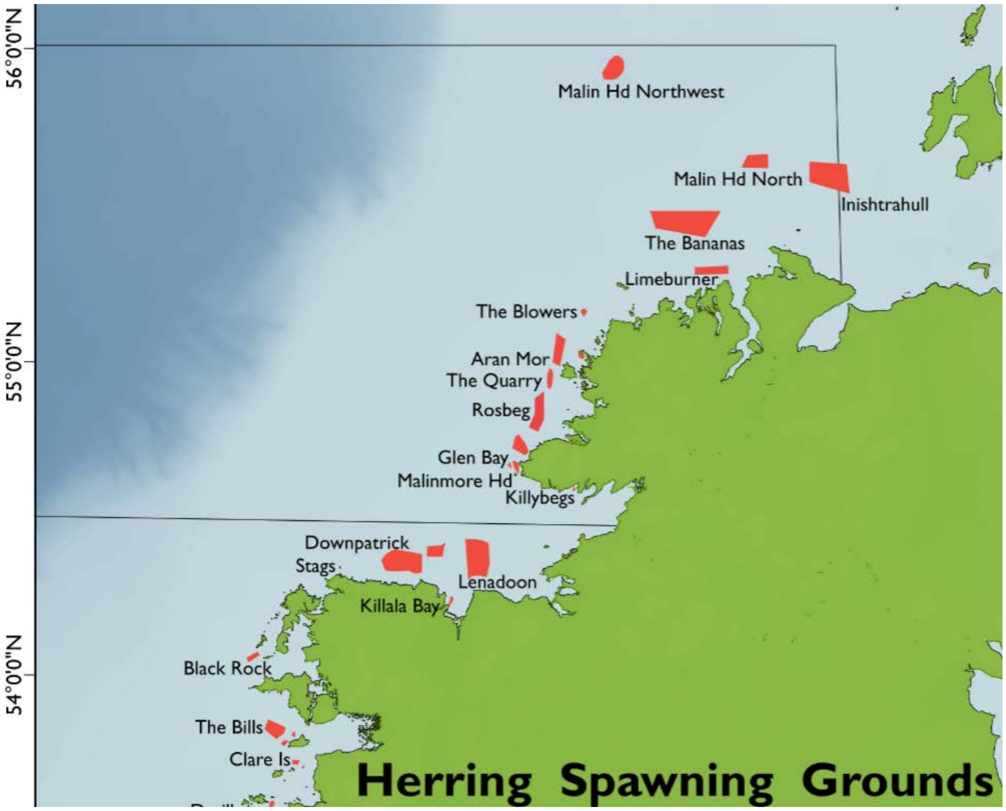


Figure 7. Herring Spawning grounds in 6aS/7b,c (from O'Sullivan, 2013).

Table 1. Spawning areas, spawning grounds and spawning beds in 6aS/7bc. Area (km^2) and depth (m) refer to individual spawning beds (from O'Sullivan, 2013).

Spawning Area	Spawning Ground	Spawning Bed	Depth (m)	Area (Sq Km)	Activity
North Donegal	Malin Head	Inishtrahull	45	121.58	November
		Malin Head North	90	39.06	November
	Limeburner	Limeburner	30	33.28	November
		The Bananas	58	169.17	Nov and Feb
	Tory	Malin Head Northwest	70-90	47.42	Nov and Feb
West Donegal	The Blowers	The Blowers	30	3.96	Oct/Nov
		Stags	20	0.89	Nov/Dec
	Aran Mor	Aran Mor 1	43	32.35	Oct/Nov
		The Quarry	70-80	11.84	October
	Rosbeg 1	Rosbeg 1.1	32-36	0.13	Oct/Nov
	Rosbeg 2	Rosbeg 2.1	43	44.06	October
	Glen Head	Glen Bay	32-36	24.17	Nov/Dec
		Malinmore Head 1	18	6.31	November
		Malinmore Head 2	90	1.59	Jan/Feb
Donegal Bay	Killybegs	Killybegs 1	20	1.01	Dec/Jan
	Lennadoon	Lennadoon 1	32-42	101.92	Jan/Feb
		Killala Bay	25	3.05	January
	Downpatrick	Downpatrick West	32	23.66	November
		Downpatrick/Ceide Fields	34-45	97.05	Dec/Jan
Mayo	The Stags	The Stags 1	36	0.89	November
	Blackrock	Blackrock 1	36	7.74	Oct/Nov
	Clare Island	The Bills	36	29.83	November
		Clare Island 1	32	3.07	Oct/Nov
		Clare Island 2	36	1.58	Oct/Nov
		South Clare Island 1	45	3.71	December
		South Clare Island 2	~40-45	2.01	Nov/Dec
	Lecky Rock	Davillaun/Lecky Rock	20	3.63	Sept/Oct

2.1.3 Timing, vessels and areas for each of the survey vessels (Table 2). Vessels undertaking acoustic work in shaded rows.

Area	**Earliest survey date**	**End date**	**Calibration date**	**Acoustic Survey distance (nm), one coverage**	**Vessel and type (Refrigerated Sea Water (RSW) or Freezer)**	**Flag**	**Homeport**	**Vessel#**	**Role**	**Skipper**
Area 4 (Hebrides)	15-Aug	28-Aug	15th August	277 nmi	Quantus (RSW)	UK	Peterhead	PD 379	**Acoustic and catch sampling**	Mark Buchan, Stuart Buchan
Area 4	24-Aug	28th Aug	NA	NA	Unity (RSW)	UK	Fraserburgh	FR 165	Morphometric work, spawning samples from 3 and 4.	Stephen Bellany
Area 3 (The Minch)	28-Aug	13-Sep	26th August	256 nmi	Zephyr (RSW)	UK	Shetland	LK 394	**Acoustic and catch sampling**	Allister Irvine
Area 3	29-Aug	02-Sep	NA	NA	Unity	UK	Fraserburgh	FR 165	Morphometric work, spawning samples from 3 and 4.	Stephen Bellany
Area 2 (North mainland)	05-Sep	16-Sep	5th Sept	298 nmi	Wiron 6 and Wiron 5 (Freezer)	UK	Plymouth	PH1100 (6), PH2200 (5)	**Acoustic and catch sampling**	Jan Melis
Area 2	05-Sep	11-Sep	NA		Annie Hillina	GER	?	ROS170	morphometrics, genetics, catch sampling	Henk Krijgsman
Area 5	28-Nov	09-	28-Nov	1575 nmi	Atlantic	IRL	Killybegs	D642	**Acoustic and**	Stevie McSharry

Area	**Earliest survey date**	**End date**	**Calibration date**	**Acoustic Survey distance (nm), one coverage**	**Vessel and type (Refrigerated Sea Water (RSW) or Freezer)**	**Flag**	**Homeport**	**Vessel#**	**Role**	**Skipper**
(North Donegal) & 6 (West Donegal)		Dec			Challenge (RSW)				**catch sampling**	
Area 1 (North pre-spawning)	26-Jul	05-Aug	NA	NA	Annie Hillina (Freezer)	GER	?	ROS170	morphometrics, genetics, catch sampling	Henk Krijgsman

2.2 Abundance estimation

2.2.1 Acoustic survey design

The purpose of the acoustic surveys was to estimate the minimum spawning biomass of herring within the boundaries of the survey areas.

Acoustic surveys were conducted in Area 2-4 (6aN) and Area 5&6 (6aS/7bc), each designed on parallel transects spaced 3 nmi apart (Figure 3 & 6). Transect direction was assigned perpendicular to the narrowest dimension of the survey area to maximise precision of the estimation by having many short transects rather than a few long ones. Replicate acoustic surveys were conducted in each of the areas in 6aN to try and capture the peak time of spawning abundance. The survey dates in each area were decided based on records of known spawning times and advice of fishermen familiar in working the areas. Vessel skippers were also confirmed that the transect direction was not following the natural line of fish density, which would have led to a biased estimate.

Sufficient time was factored in to the planning to provide opportunity for the survey areas to be adapted according to the situation observed, such as changes to the survey boundary to ensure full coverage fish aggregations, or undertaking finer scale observations in high density locations (e.g. in 6aS/7bc- the Bananas, Lough Swilly, and Glen Head/Rathlin O'Beirne). Table 3 summarises the design and equipment for each area, and notes any adaptations to the original planned survey transects.

2.2.2 Equipment specifications and calibration

See Table 3 for specification.

The standard calibration procedure described in Demer et al. (2015:http://courses.washington.edu/fish538/resources/CRR326_Calibration.pdf was used to calibrate each the echosounders deployed on each of the vessels. Standard LOBE calibration (SIMRAD 2003) was carried out on the Atlantic Challenge on evening of 28/11/2016 and morning of 29/11/2016. The successful calibration was made possible by good conditions in the deep water at the new pier (~20m slack high). There was minimal interference from biota in the water column (Figure 8).

Figure 8. Hull mounted echosounders (Atlantic Challenge D642) were calibrated at the new pier in Killybegs.

2.2.3 Acoustic survey protocols

Surveys in 6aN were conducted in daylight hours only, 05:00 to 19:00 UTC/GMT. At the beginning of the next day, the survey restarted and continued from the position it ended on the day before. This maintained continuity in the coverage and avoided the possibility of double counting herring schools, which can occur if the survey does not continually progress in the same direction. Surveys in 6aS/7bc were continuous over 24hours due to the limited daylight in December and scale of coverage planned. Survey speed was 10 knots for all vessels, reducing as needed in the case of poor sea state.

To maximise data quality, FV Quantus took on board ballast water to aid stability of the vessel and minimise cavitation. In addition, all other acoustic equipment was turned off to eliminate interference with the EK80. Only during fishing operations were other acoustic instruments used. A motion reference unit was installed on the second coverage of the area, further improving data quality.

Survey log sheets were used to record all transect data, including transect position, haul position and other events taking place on and off transect.

Raw acoustic data were recorded and stored on portable hard disk drives for later processing.

2.2.4 Fishing operations for scientific samples

During the acoustic surveys, selected fish marks were targeted with a fishing operation (Figure 9) to capture fish for the purposes of:

(i) Confirming the species identity of acoustic marks, particularly those suspected to be herring or to confirm that they were definitely not herring.

(ii) Collecting samples for biological analysis.

The fishing operations of RSW vessels were directed to take a catch of the smallest possible size sufficient for biological sampling. The operation for freezer trawlers was a typical commercial catch.

Each surveying vessel was granted a derogation to discard fish that were not retained for biological sampling and to retain any catches of herring, up to the maximum specified quota taken either during or outside the survey period.

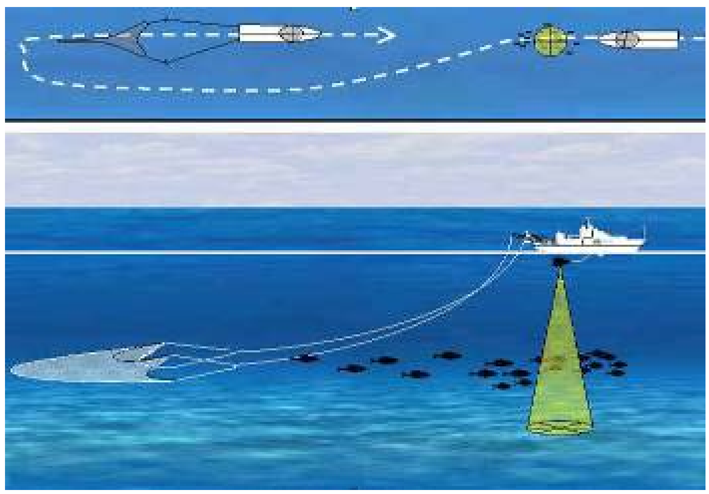


Figure 9. Schematic description of fishing operation to collect a biological catch ample during an acoustic survey.

2.2.4.1 Comparisons of towed-body and hull-mounted echo sounders

During the acoustic survey on board of Wiron 6, acoustic data were simultaneously collected from a towed body and hull mounted transducer (Figure 10) , providing the opportunity to compare if there were any significant differences in abundance estimates arising from different tools. One reason for using a towed-body is because it should be less vulnerable than a hull mounted transducer to disturbances such as waves and air bubbles, an so we might expect to see some differences in the echodata.

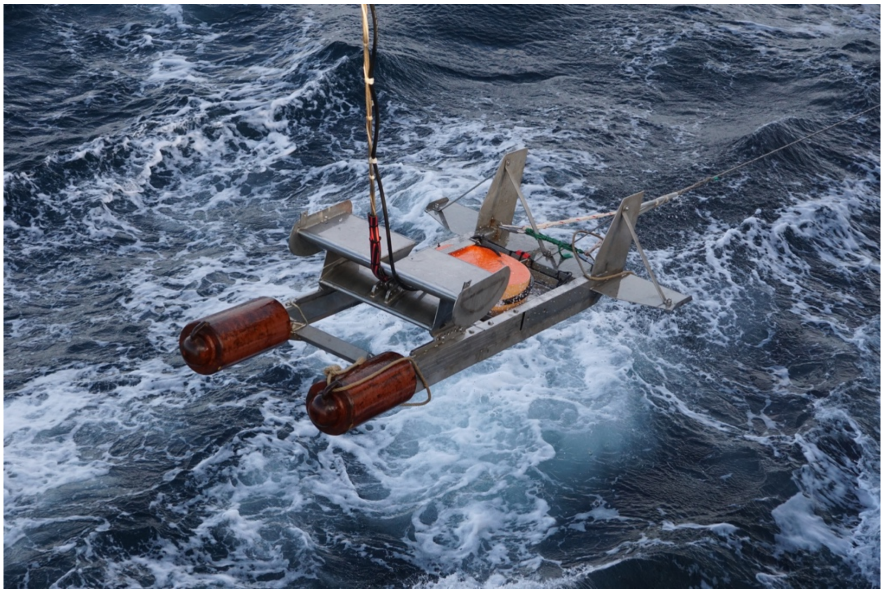


Figure 10. The towed-body that was used for acoustic data collection during the survey. The orange part is the transducer that generates and receives the acoustic signals. The cable attached transports the information to a computer on the bridge, where the data is stored. *(Photo: Dick de Haan, Wageningen Marine Research)*

Table 3. Acoustic survey summary

Area	Vessel	Transducer and Frequency	Echosounder	Power Pulse duration Ping interval	Environment	Calibration Location/ date	Survey area changes
2 - North Mainland	Wiron 6	Towed body, split beam ES38B (38Khz). Hull mounted split beam ES38B (38Khz)	SIMRAD EK60	Power: 2000W Pulse duration: 512µs Ping rate: 2 Hz (interval = 0.5 seconds)		Scapa flow 4th Sept 2016	Additional fine scale surveying around spawning aggregations
3 - The Minches	Zephyr	Towed body, split beam ES38B	SIMRAD EK60	Power: 2000W Pulse duration: 1.024ms Ping interval = 1.0 sec	Temp = 10C, Salinity =35, Sound speed 1491.5 m/s	Scapa flow 26th Aug 2016	Extended survey northern and western boundary to cover fish marks. Additional fine scale surveying on identified herring aggregation in northern part of the area.
4 – Outer Hebrides	Quantus	Hull mounted split beam ES38B (38Khz), draft 5.1m Survey 1, without Motion Reference Unit, Survey 2, with Motion Reference Unit	SIMRAD EK80	Pulse type = CW Power: 2000W Pulse duration: 1.024ms Ping interval = 0.5 sec	Temp = 10C, Salinity =35, Sound speed 1491.5 m/s	Scapa flow, 15th July 2016	Additional fine scale (1.5nm) transects covering centre of commercial fishing area
5 South Donegal & 6 West Donegal	Atlantic Challenge	Hull mounted split beam ES38B (38kHz) Hull mounted split beam ES120B (120kHz)	SIMRAD EK60	Power: 2000W (38kHz); 500W (120kHz) Pulse duration: 1.024ms Ping interval = max	Temp = 10˚C, Salinity =34ppt, Sound speed 1488.6 m/s	New Pier, Killybegs, Co. Donegal 28th November 2016	Additional transects in Lough Swilly. Additional searching conducted with the sonar in the Tory Bank area.

2.2.5 Biological sampling

The purpose of the biological sampling was to (i) provide data on the relative abundance of each length and age class of herring, which is needed to make age-disaggregated acoustic abundance estimates. *Samples were also used to (ii) determine the maturation state of herring and to indicate the location and timing of spawning, (iii) for genetic analysis (see section 2.3), which are not reported here.*

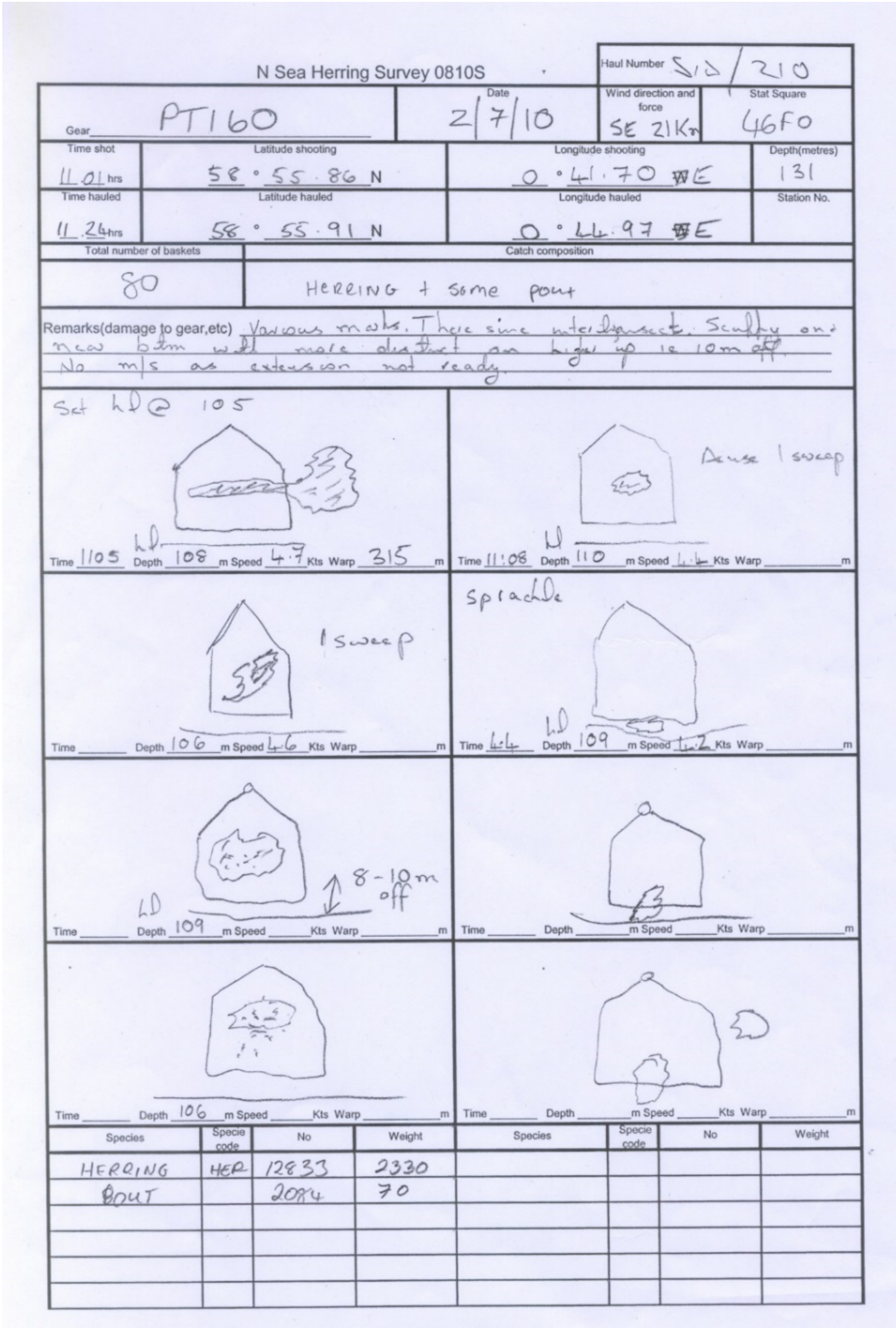
2.2.5.1 Haul information

Haul data were recorded using the same template for all surveys, 1 sheet per haul. Information was recorded on the date, time, fishing position, depth, gear, catch composition, total weight of catch and weight of the sub sample taken for length frequency and biological sampling. For hauls used in helping to scrutinize the acoustic data, additional information was recorded on the sheets to show how the acoustic traces looked on the netsonde and echosounder (Figure 11). A screen dump from the echosounder was also taken on some of the surveys. In the remarks box, comments were made on whether or not herring was spawning (based on "running" eggs and sperm upon capture) and whether any catch remaining after biological sampling was retained or discarded.

2.2.5.2 Catch sampling

The catch sampling procedure was as follows:

- Weight of the catch of all species, or where the catch was too large, 5 randomly mixed baskets were taken as a sample of the catch and weighed.
- The catch sample was sorted and the total weight of each species recorded.
- One full basket (or 2 half) of herring were weighed (approx. 30kg, 200 herring). This subsample was used determine lengths, weight, age and for genetics. (see below). (Figure 12)



N Sea Herring Survey 0810S

Haul Number S10 / 210

Gear	Date	Wind direction and force	Stat Square
PT160	2/7/10	SE 21Kn	46F0

Time shot	Latitude shooting	Longitude shooting	Depth(metres)
11.01 hrs	58 ° 55.86 N	0 ° 41.70 E	131
Time hauled	**Latitude hauled**	**Longitude hauled**	**Station No.**
11.24 hrs	58 ° 55.91 N	0 ° 44.97 E	

Total number of baskets	Catch composition
80	HERRING + some pout

Remarks(damage to gear,etc) Various marks. There since [illegible]. Scuffy on new btm with more distinct on higher up ie 10m off. No m/s as extension not ready.

Set hd @ 105

Time 1105 Depth 108 m Speed 4.7 Kts Warp 315 m

Dense 1 sweep

Time 11:08 Depth 110 m Speed 4.4 Kts Warp m

1 sweep

Time Depth 106 m Speed 4.6 Kts Warp m

sprackle

Time 4.4 Depth 109 m Speed 4.2 Kts Warp m

8-10m off

Time Depth 109 m Speed Kts Warp m

Time Depth m Speed Kts Warp m

Time Depth 106 m Speed Kts Warp m

Time Depth m Speed Kts Warp m

Species	Specie code	No	Weight	Species	Specie code	No	Weight
HERRING	HER	12833	2330				
POUT		2084	70				

Figure 11. Example haul data recording sheet, to be entered in to Excel template later.

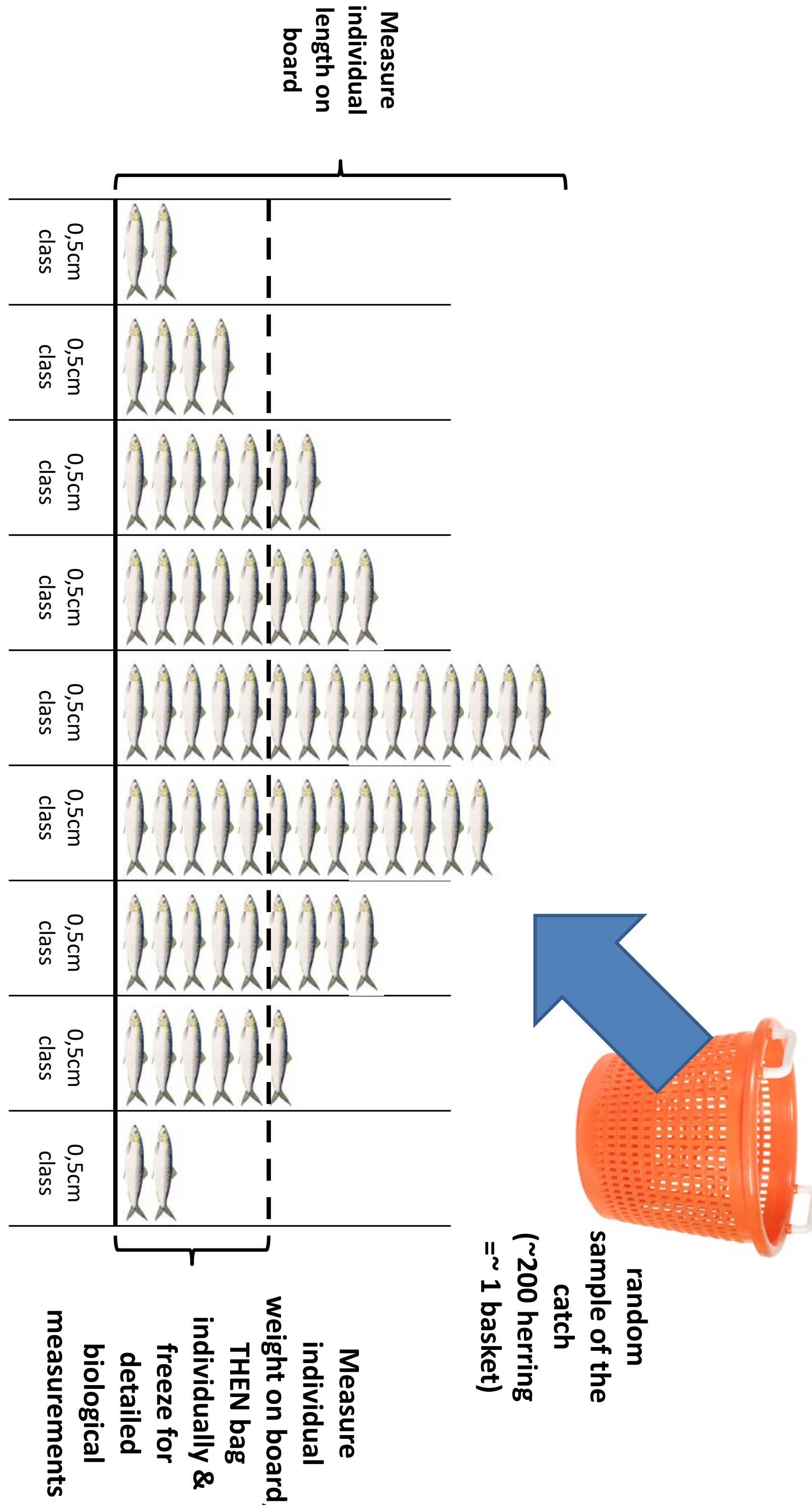


Figure 12. Illustration of the required catch sampling procedure.

2.2.5.3 Length measurements

The length of all the herring in the subsample was measured and recorded to the nearest half centimetre below (e.g. if the fish was 24.7cm then it was recorded as 24.5cm). This data is used to determine a length frequency distribution of the catch and subsequently to apply an age-disaggregated estimate of biomass. Five fish from each half centimetre length class were saved for additional biological measures (section 2.2.7).

2.2.5.4 Otoliths for age determination

Taking the 5 fish in each length class, each measured fish was assigned an ID number and the otoliths extracted for age determination at the lab.

Standard procedures for age determination from the growth rings on the otoliths (ear bones) of herring (ICES 2005) were used to determine the age of fish sampled. This age data was used to create an age-length key (ALK).

2.2.6 Acoustic Analysis methods

2.2.6.1 Echogram scrutinisation – partitioning to species

Scrutinising echograms involves identifying fish marks and assigning them to species, and ensuring that any non-fish acoustic signals are not included as fish (e.g. bottom signals).

Assigning fish marks to species is a heuristic process that relies upon (i) evidence from the targeted hauls made during the survey (Figure 13), (ii) prior experience of 'experts' (fishermen and acoustic scientists) based on their knowledge of what was caught when certain types of fish marks were fished upon in the area in previous surveys occurring around the same time, and (ii) knowledge of fish behavior.

While it's impossible to be 100% confident when assigning fish marks to species, following some agreed guidelines for classification of marks greatly improves the consistency in the way that acoustic data from different surveys are scrutinized, and hence in the quality and comparability of the biomass estimates.

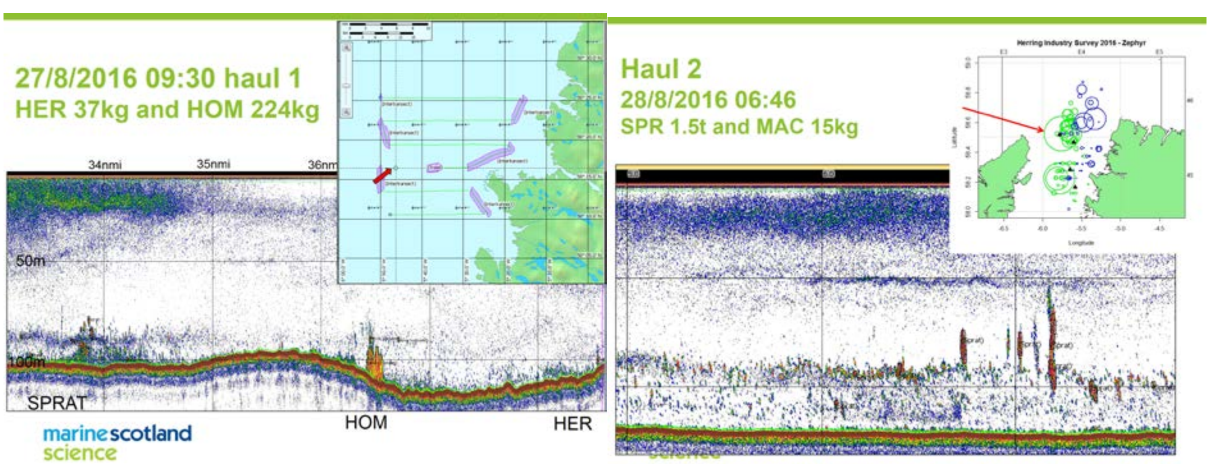
Acoustic fish marks were classified in to the following categories (See examples in Figure 13):

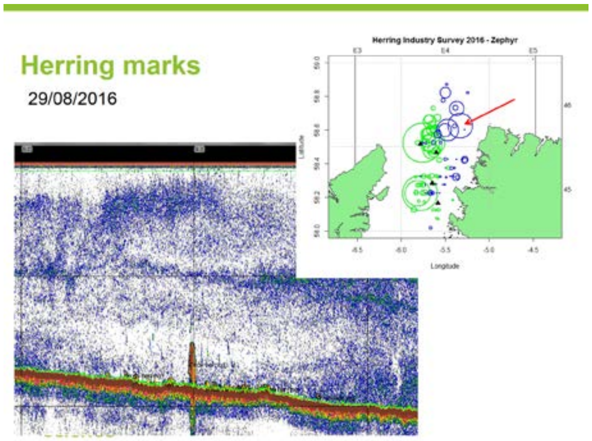
- **Herring** – confident that the marks were herring based on either evidence from a targeted haul or proximity and similarity to other schools known to be herring.

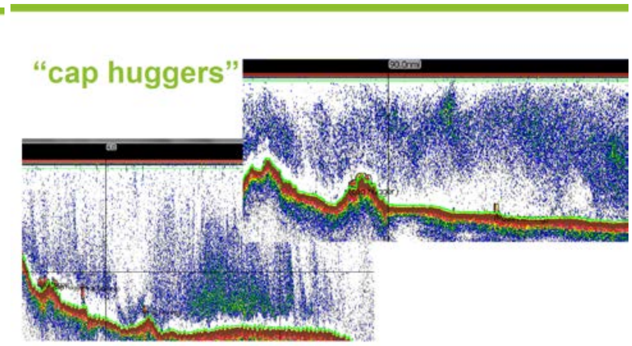
- **Cap-hugging herring** - concentrations of fish tightly associated with prominent outcroppings (cap) on the seabed. Believed to be herring, but not possible to confirm with trawling. Where marks on the sides of steep slopes of the outcropping occurred, they were excluded from the analysis because of the possibility of being registration of acoustic side lobes.
- **Sprat** – confident that the marks were sprat based on either evidence from a targeted haul or proximity and similarity to other schools known to be sprat.
- **Unclassified –** confident that the marks were not herring or sprat based on either evidence from a targeted haul or proximity and similarity to other schools known to not to be herring, or characteristic atypical of herring schools.
- **Horse mackerel –** a lot of horse mackerel marks were observed through 6aS/7bc. Marks were verified with numerous trawls.
-

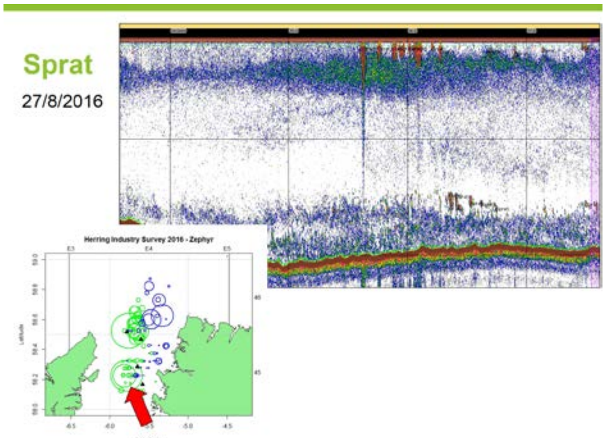
How strongly the acoustic marks are displayed on the screen (backscatter threshold) can have a bearing on the interpreters classification of the acoustic marks and their selection using school detection algorithms. While it is desirable to be consistent in the setting of this parameter, in practice the setting is determined largely by the need to filter out fish schools from other acoustic signals that create noisy backscatter data.

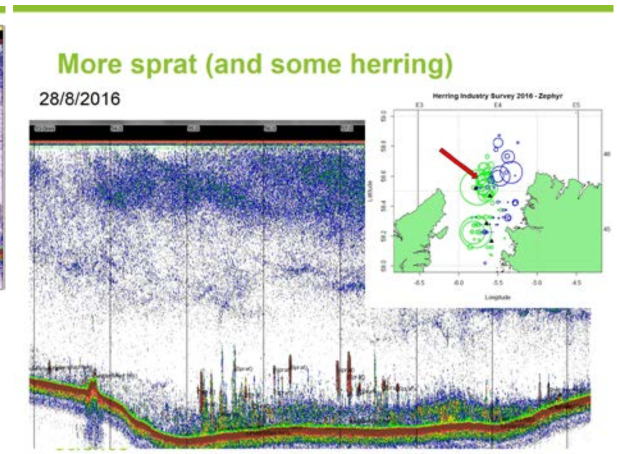
For Quantus, the backscatter threshold for school detection was -59dB.

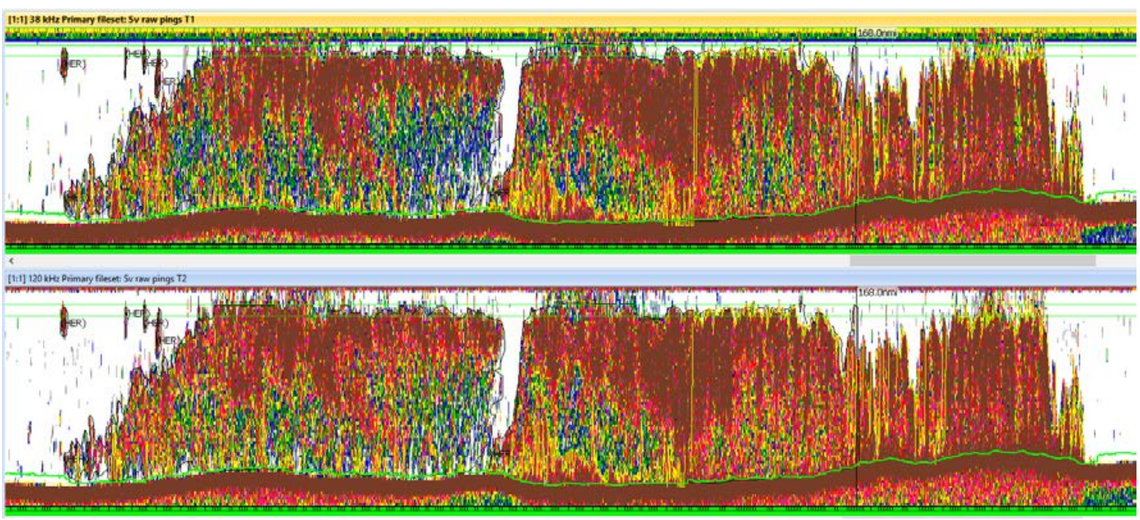




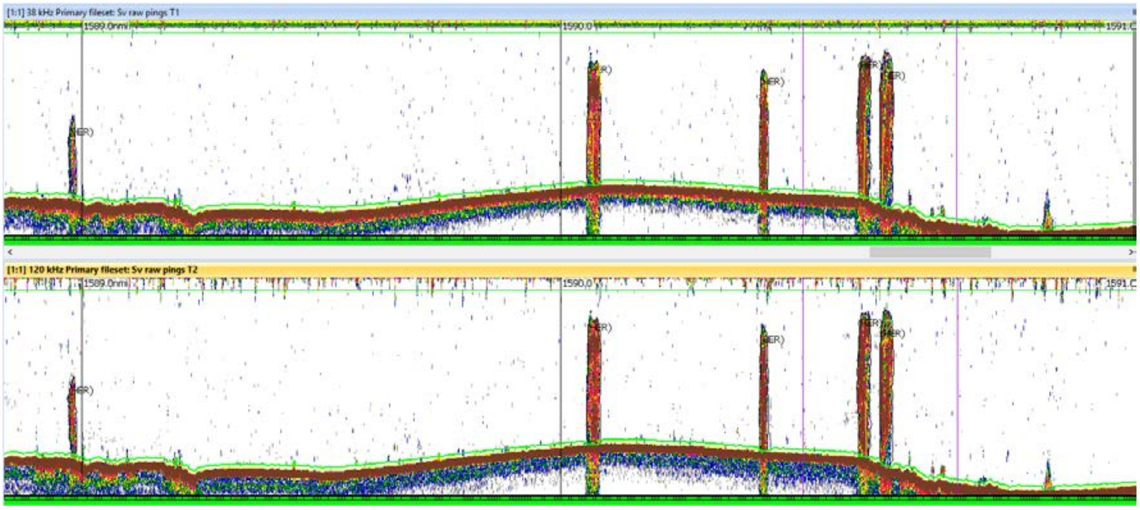




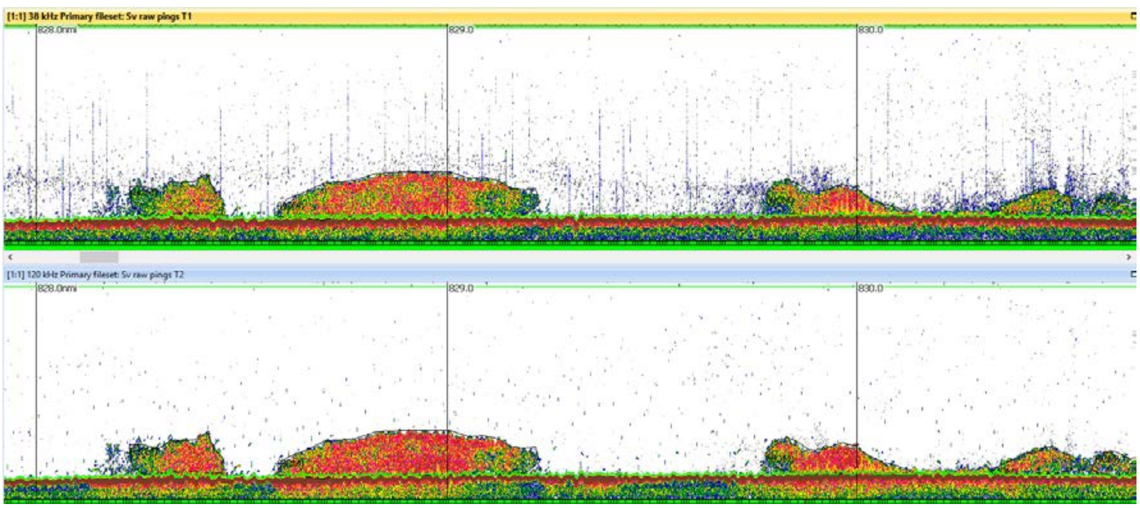




Large herring mark in Lough Swilly, Co. Donegal (6aS)



Series of herring marks in Donegal Bay (7b)



Horse mackerel marks obsereved throughout Tory Bank area (6aS)

Figure 13. Examples of acoustic marks and their identification.

2.2.6.2 Age disaggregated abundance estimation

The process for estimating abundance and biomass from the acoustic data is shown in Figure 14, with additional description given below.

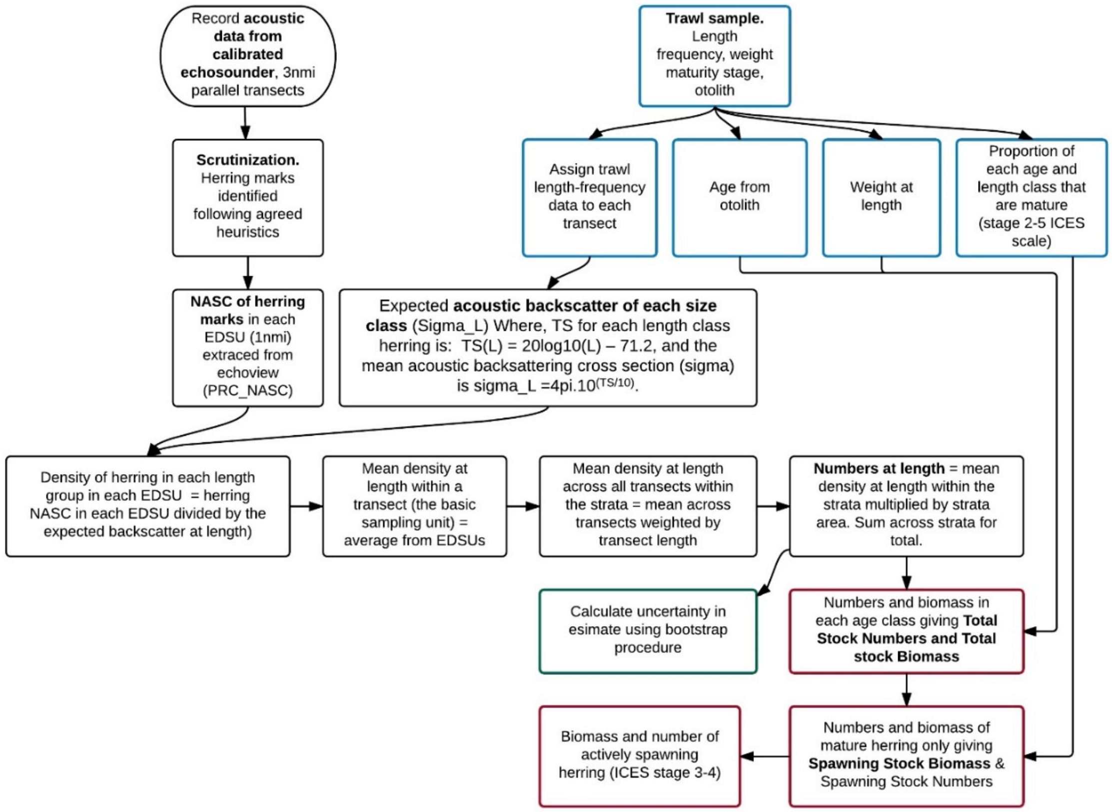


Figure 14. Flow diagram of the analysis methods to estimate abundance and biomass. Blue boxes – biological data; black boxes – treatment of acoustic data; red boxes- derived abundances indices; green box – uncertainty estimates

The StoX software (http://www.imr.no/forskning/prosjekter/stox/nb-no) was used to calculate the age disaggregated acoustic abundance estimates. StoX is an open source software developed at IMR, Norway to calculate survey estimates from acoustic and swept area surveys. The program is a stand-alone application built in Java for easy sharing and further development in cooperation with other institutes, and is now routinely used to derive abundance estimates from WGIPS coordinated surveys. Documentation and user guides are available from the website. Estimation of abundance from acoustic surveys with StoX is carried out according to the stratified transect design model developed by Jolly and Hampton (1990).

Following scrutinization of the echograms and export of the Nautical Area Scattering Coefficient assigned to herring marks (PRC_NASC from Echoview software), the calculation of age disaggregated abundance was as follows:

1. **Define survey strata.** In 6aN, each of the 3 areas surveyed and any fine-scale detailed grid searches within them was assigned as a strata (Figure 15). In 6aS/7bc

3 strata were defined, (i) Lough Swilly, where the boundaries of the strata was delineated approximately 500m either side of the centre line of the deepest part of the Lough Swilly channel in approximately 10 – 20m water depth. (ii) Donegal bay where several large herring marks were found within a small defined area, (iii) the rest of the nortwest area of the survey.

2. **Assigning herring length data from trawls to acoustic transects.** For each transect within each survey strata, the length distribution of herring associated with the transect was determined as the un-weighted mean of all trawls allocated to the respective transects (Figure 15).
3. **Expected backscattering cross section of herring in each length group.** The mean acoustic backscattering cross-section "sigma" (σ_{bs}) for each length group of herring was calculated from the length frequency data assigned to each transect using the target strength-length relationships for herring recommended by the ICES Working Group on International Pelagic Surveys. Where, the target strength (TS) relationship used to calculate the mean acoustic backscattering cross-sections for herring is:

$$TS = 20\log10(L) - 71.2 \qquad [\text{at } 38\text{kHz}]$$

and the mean acoustic backscattering cross section is:

$$\sigma_{sp} = 4\pi.10^{(TS/10)}$$

4. **The average density of herring in each length class on a single transect** were calculated by dividing the Nautical Area Scattering Coefficient (NASC - the area backscattering coefficient for a particular integration region in areal units (m^2/nmi^2), within each Elementary Distance Sampling Unit (EDSU, here =1nmi) on each transect by the length-specific σbs (acoustic fish backscatter) assigned to the transect, then averaging over the EDSUs.
5. **Numbers of herring in a single stratum & total numbers.** For each length group, a weighted average (weighted by transect length) of the mean density of herring in each transect is multiplied by the area of the stratum. Total numbers at length is the sum for each stratum.
6. **The numbers and biomass per age & maturity class.** Trawl data on the relationship between length, age and maturity stage were used to partition the numbers at length to estimates of numbers and biomass in each age class and maturity stage. The 9 point maturity stage classification used in the Scottish and

Irish sampling (MSS manual 2011) ers was converted to the ICES 6 point scale prior to analysis (Table 4) (ICES 2011).

7. **Estimate of the relative sampling error.** Within StoX a bootstrap procedure was used to estimate the coefficient of variance (CV) of the estimate of numbers at length. The procedure randomly selects transects within a stratum in every n bootstrap iteration (n =1000 check). For each selected transect, biological information from trawl stations that were assigned to the transect are randomly sampled and used as input to estimate fish abundance in the stratum in that particular bootstrap iteration. Each bootstrap iteration follows the same estimation procedures as used in StoX and described above (using the combination of mean acoustic density per transect and associated biological information, to estimate fish numbers at length in each stratum).
8. **Choosing the best estimate from replicates**. In the 6aN, 2 replicate acoustic surveys were conducted for each stratum. The maximum biomass estimate of these was chosen as the best estimate.

Acoustic data were recorded on hard-drives at sea and uploaded to network facilities back at the laboratory. The acoustic metadata and cleaned post-processed EV files will be stored using Marine Scotland Science data base following established procedures. 6aS/7bc raw and processed data will be stored at the Marine Institute, Ireland. Estimates of abundance made from the surveys will be stored in the ICES WGIPS acoustic database.

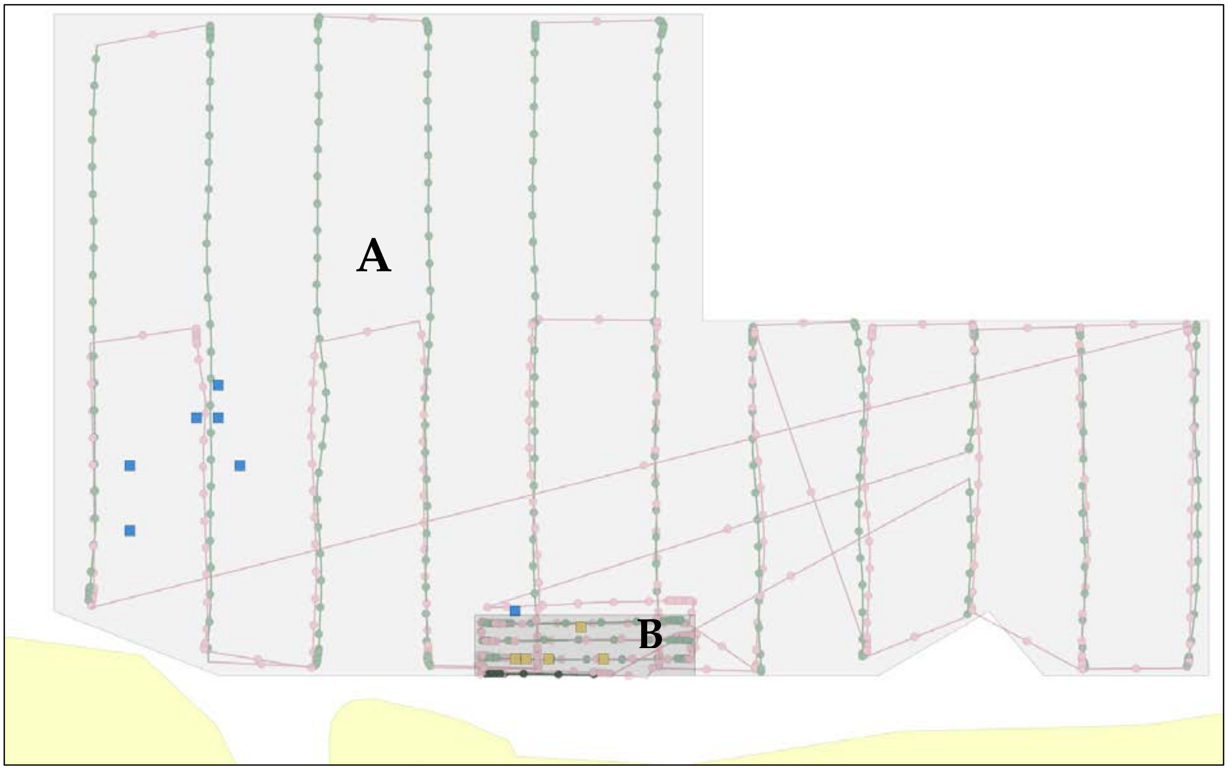


Figure 15a. Acoustic survey in 6aN, Area 2 North mainland. Transects and strata used in the analysis of the acoustic survey in area 2 conducted by Wiron. Hauls in blue were allocated to all transects in strata A (lighter colour). The hauls in yellow colour were allocated to all transects within strata B (darker colour).

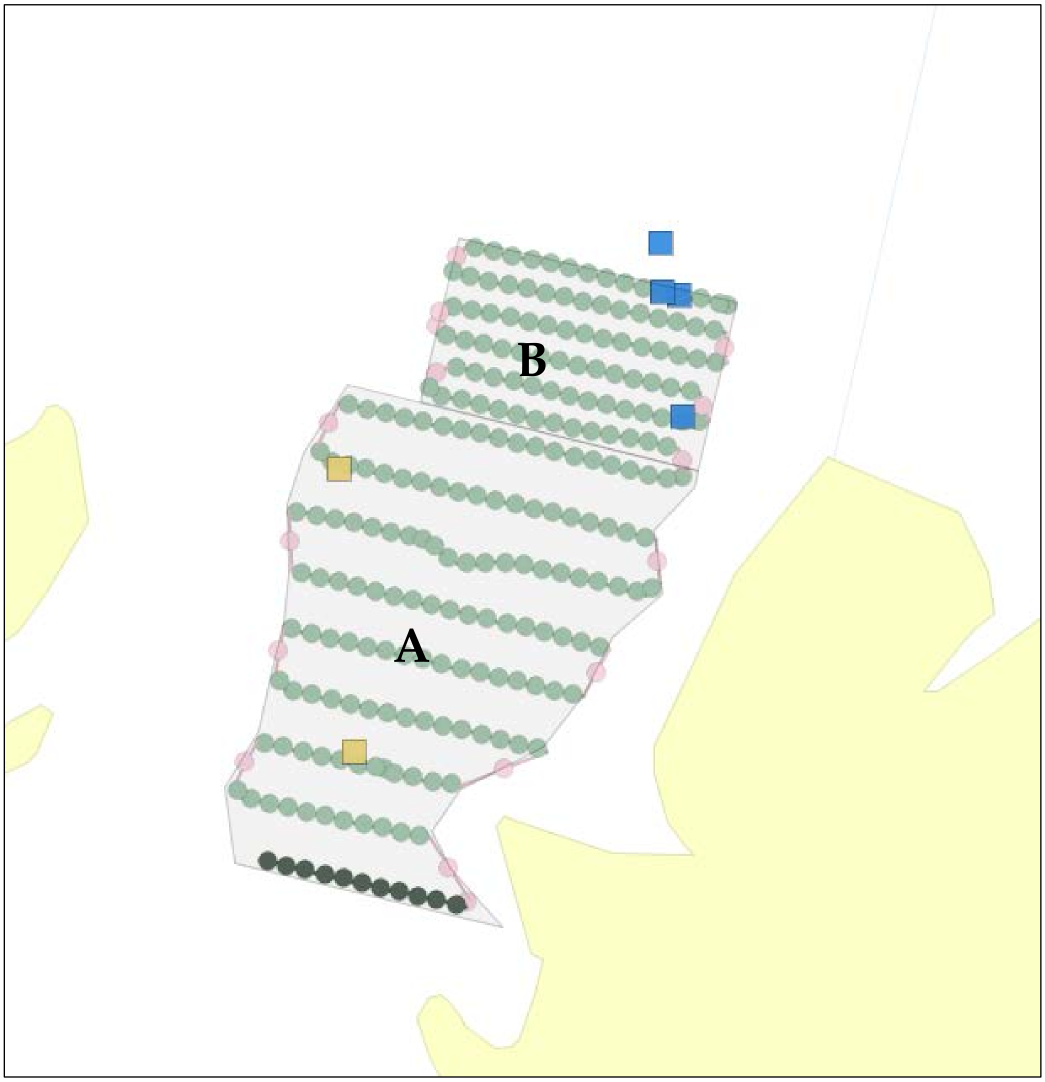


Figure 15b. Acoustic survey in 6aN, Area 3 The Minch. Zephyr survey track run 1 (27 – 29 Aug). Hauls marked in yellow are hauls conducted on Zephyr which caught herring. These two hauls were allocated to all transects in strata A. The hauls in blue were conducted on Unity at the same time as the acoustic survey on Zephyr. These were allocated to all transects in strata B.

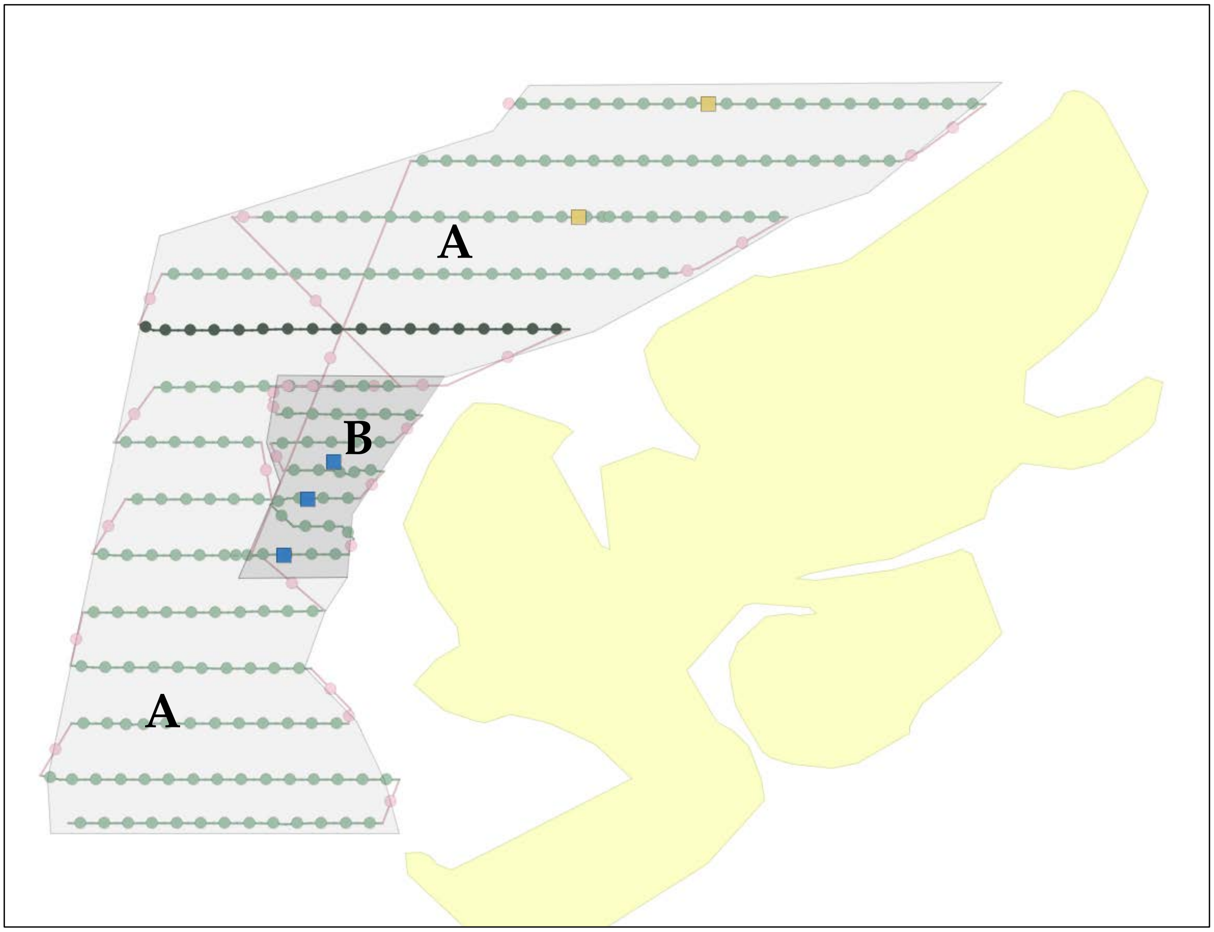


Figure 15c. Acoustic survey in 6aN, Area 4 Hebrides. Transects and strata used in the analysis of the acoustic survey in area 4 conducted by Quantus. Hauls in yellow were allocated to the five most northerly transects in strata A. The hauls in blue colour were allocated to all transects within strata B and to transects south of the transect highlighted in black in Strata A.

Table 4. Translation of Marine Scotland 9 point maturity scale to ICES 6 point scale

NINE POINT MATURITY SCALE (MARINE SCOTLAND MANUAL)	EQUIVALENT ICES SCALE STAGE
1 Immature virgin	1 (Immature)
2 Immature	1 (Immature)
3 Early maturing	2 (Mature – but not included in spawning category))

4 Maturing	2 (Mature – but not included in spawning category)
5 Spawning prepared	3 (Mature – included in spawning category)
6 Spawning	3 (Mature – included in spawning category)
7 Spent	4 (Mature – Spent – included in spawning category)
8 Recovering/resting	5 (Mature – resting - not included in spawning category)
9 Abnormal	6 (Abnormal – not included in Mature or spawning categories)

2.3 Sampling summary

2.3.1.1 Sampling statistics 6aN

Maps of the survey tracks, relative acoustic density, and locations of hauls that were used to determine biological parameters for the estimation of the biomass of herring in 6aN are shown in Figure 16 – 19, Table 5.

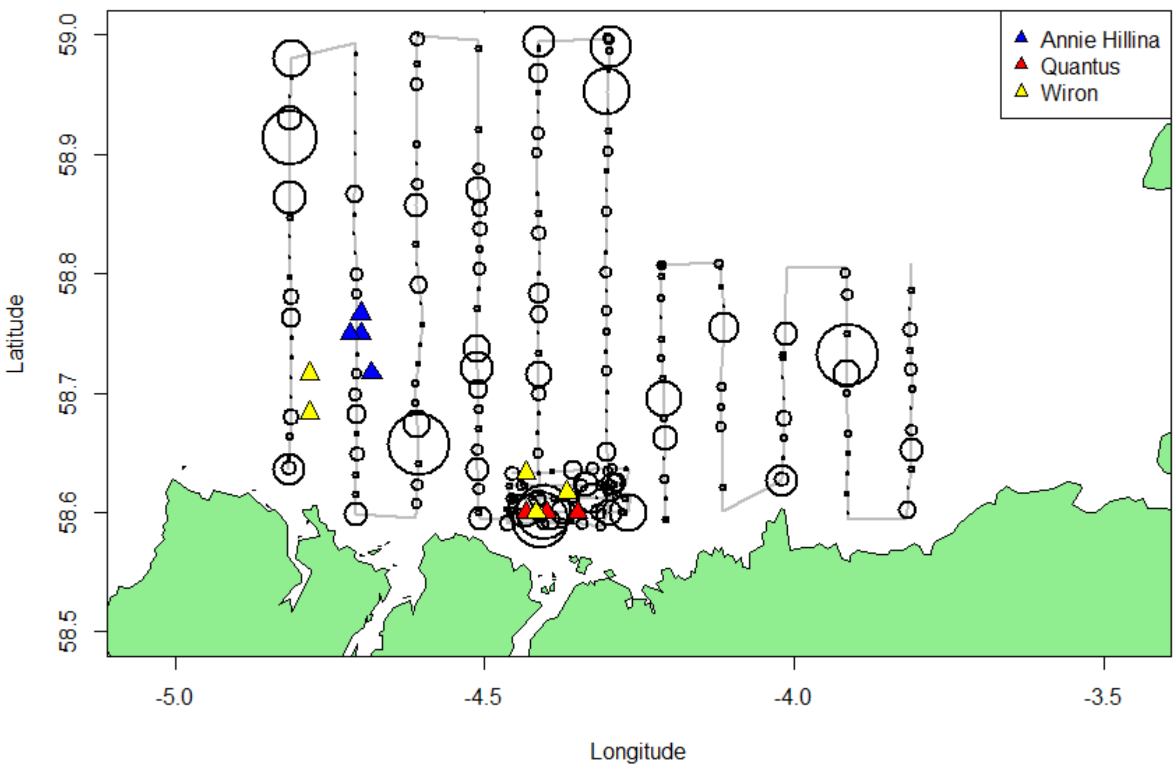


Figure 16a. Area 2 North mainland, relative acoustic density (NASC m²/mn²).

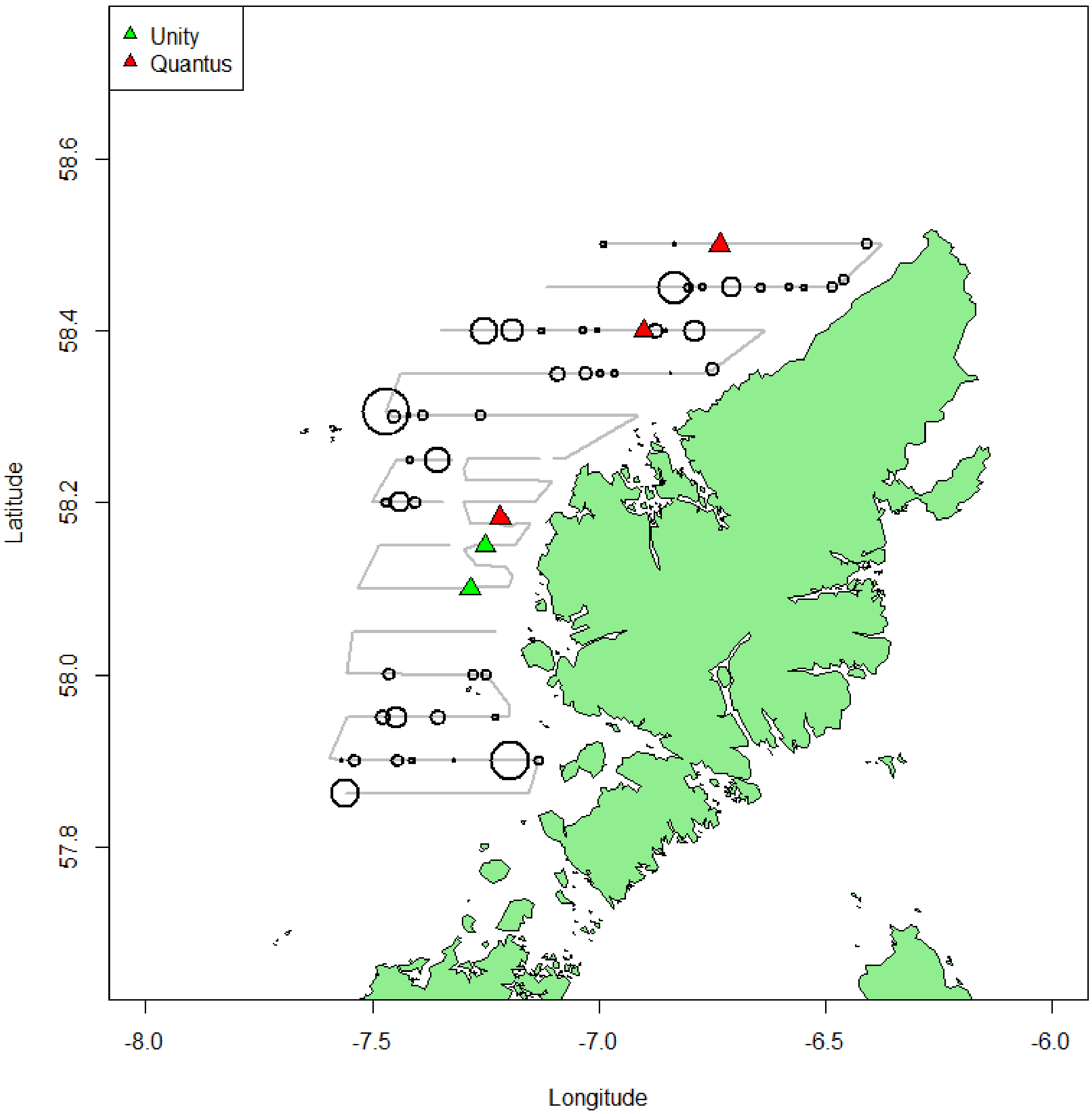


Figure 16b. Area 3 The Minch, relative acoustic density (NASC m²/n.mi²).

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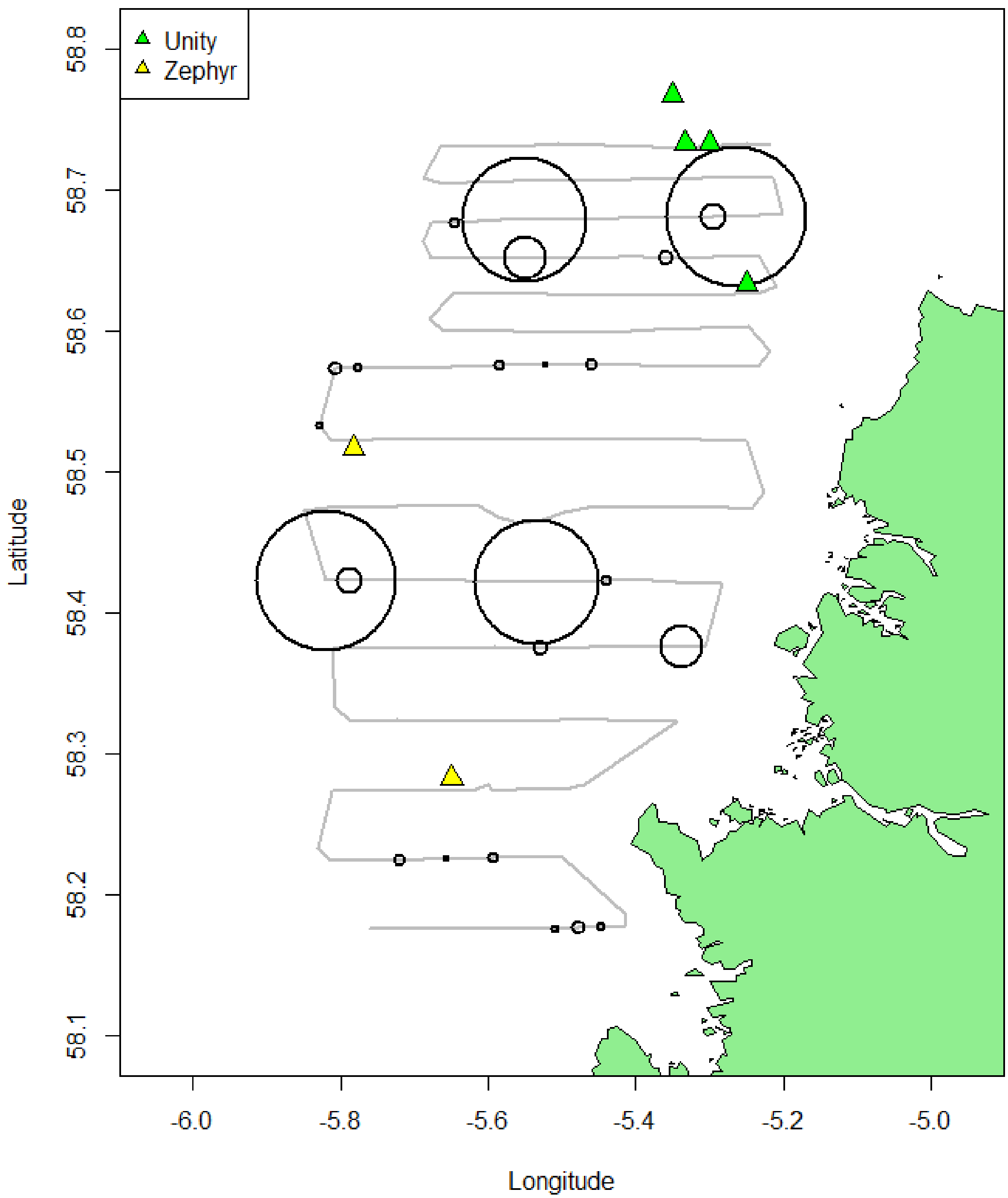

Figure 16c. Area 4 Outer Hebrides, relative acoustic density (NASC m²/n.mi²).

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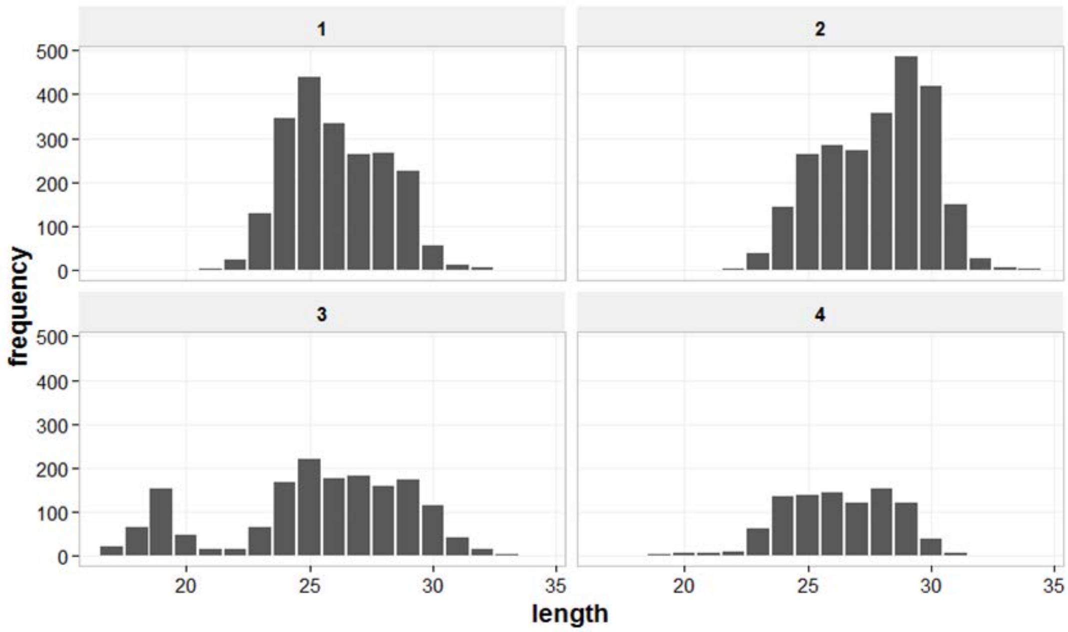

Figure 17. Length (cm) frequency distributions of herring in each survey area

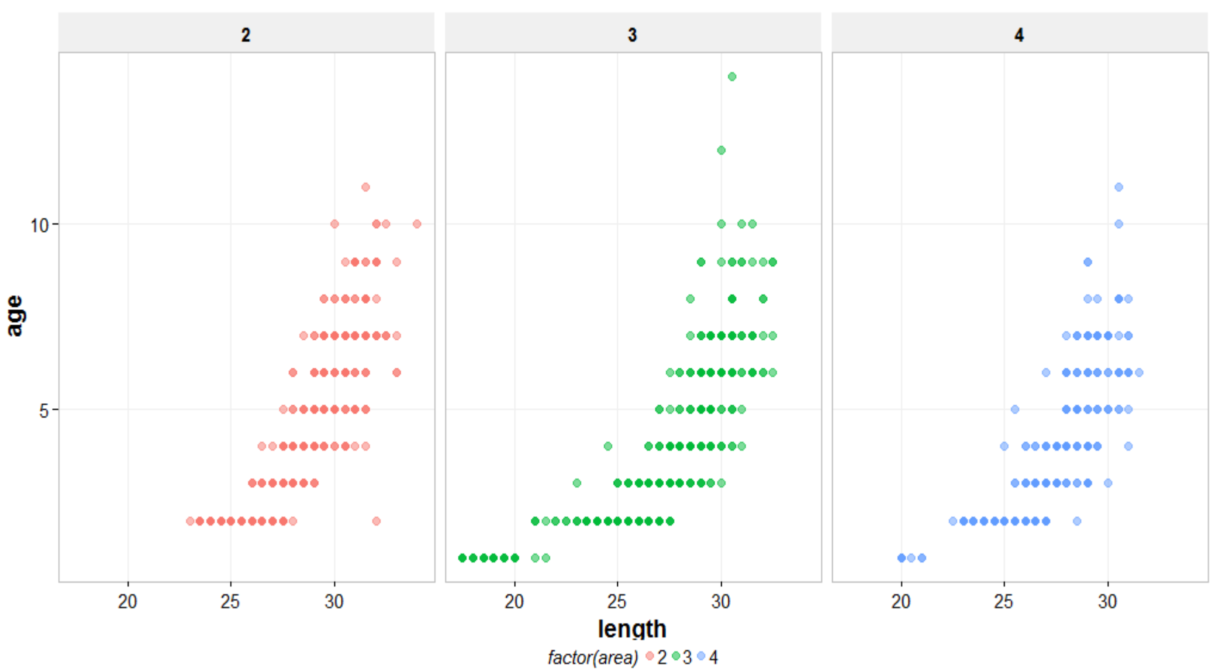

Figure 18. Age at length in each survey area

Figure 19. Maturity stage distribution in each survey area

Table 5. Haul information and catch composition for hauls relevant to the analysis of the acoustic surveys in 6a North in 2016 (Only hauls catching over 29 herring and used in the analysis included in this table).

Vessel	Haul no.	Date	Time (UTC)	Position	Used in analysis area	Catch (kg)			
						Herring	Sprat	Mackerel	Horse Mackerel
Zephyr	1	27/08/2016	09:49	58°14' N, 005°39' W	3	37	0	8	224
Zephyr	3	28/08/2016	11:12	58°31' N, 005°47' W	3	232	1800	32	0
Unity	3	26/08/2016	13:25	58°34' N, 005°40' W	3	90	198	12	0
Unity	5	26/08/2016	18:55	58°46' N, 005°21' W	3	125	0	100	25
Unity	6	27/08/2016	07:35	58°44' N, 005°20' W	3	40500	0	4500	0
Unity	8	29/08/2016	06:17	58°44' N, 005°18' W	3	135	0	3	5
Quantus	2	17/08/2016	13:10	58°24' N, 006°54' W	4	140	0	869	191
Quantus	3	18/08/2016	08:07	58°11' N, 007°13' W	4	72	0	0	0
Quantus	11	25/08/2016	09:48	58°30' N, 006°44' W	4	36	0	72	75
Quantus	12	25/08/2016	15:24	58°09' N, 007°13' W	4	600	0	0	0
Unity	2	25/08/2016	17:34	58°06' N, 007°17' W	4	3325	0	0	0
Unity	7	28/08/2016	13:05	58°09' N, 007°15' W	4	1600	0	0	0
Wiron 6	3	08/09/2016	02:00	58°36' N, 004°26' W	2	120000	0	0	0
Wiron 6	4	08/09/2016	05:00	58°36' N, 004°25' W	2	120000	0	0	0

Wiron 6	5	09/09/2016	13:40	58°38' N, 004°47' W	2	110000	0	1600	0
Wiron 6	6	10/09/2016	03:45	58°36' N, 004°47' W	2	75000	0	1100	0
Annie Hillina	6	12/09/2016	23:55	58°45' N, 004°42' W	2	20211	0	1572	449
Annie Hillina	7	13/09/2016	06:35	58°45' N, 004°43' W	2	76672	0	2421	0
Annie Hillina	9	15/09/2016	21:56	58°43' N, 004°41' W	2	21588	0	909	0
Annie Hillina	10	16/09/2016	20:01	58°46' N, 004°42' W	2	3430	0	108	36

2.3.1.2 Sampling statistics 6aS/7bc

A total of three hauls were completed in 6aS/7bc, however, only one contained herring. In some areas where marks of herring were observed, the vessel was unable to fish due to the shallow water depth (e.g. <20m in Lough Swilly) and size of gear available. The monitoring fishery was being conducted at the same time as the survey, on smaller boats in the same areas. Biological samples from some of these vessels were used to augment the sample from the survey. Samples were taken from boats fishing in Lough Swilly and Donegal Bay as close spatially and temporally as possible to the survey in these areas (Table 6).

Table 6. Biological sampling summary statistics from hauls and samples in 6aS/7bc survey

Haul/Station	Date	Location	Fish (measured/lengths)	Ages/maturity/sex
1	2/12/2016	Offshore	200	50
4	29/11/2016	Lough Swilly	337	69
5	16/11/2016	Lough Swilly	268	64
8	21/11/2016	Donegal Bay	248	75
9	21/11/2016	Donegal Bay	183	48
10	13/12/2016	Donegal Bay	250	56

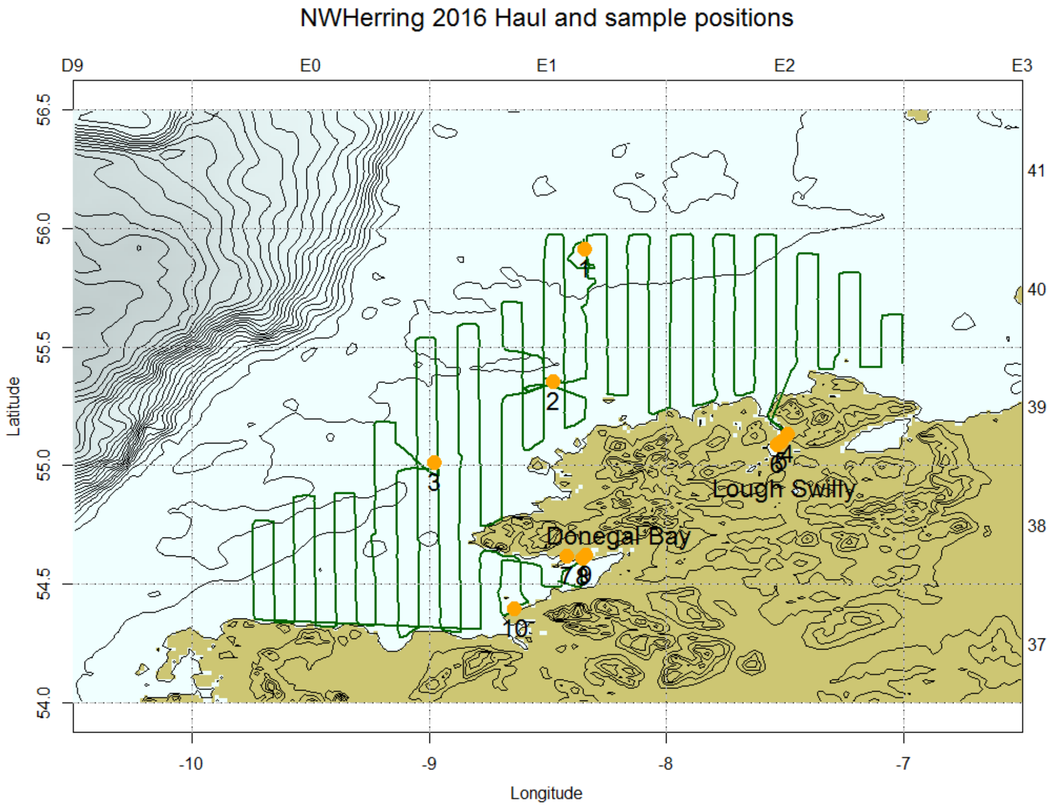

Figure 20. Distribution of biological samples and acoustic transect data in 6aS/7bc - all samples and acoustics.

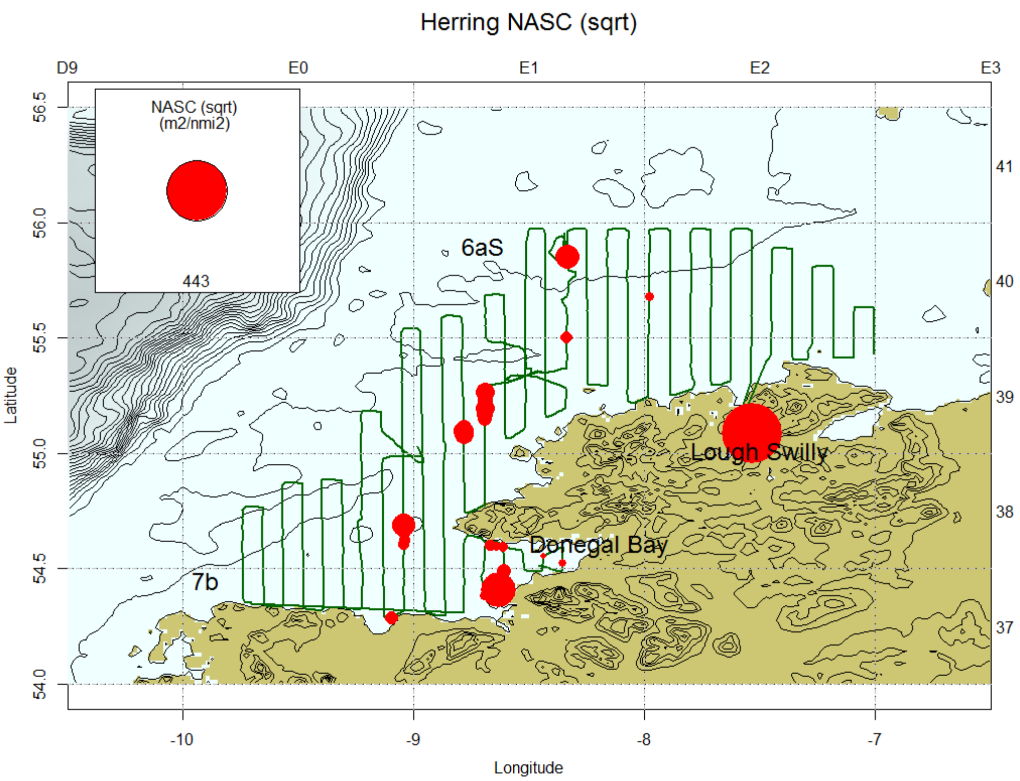

Figure 21. NASC (sqrt) of herring in 6aS/7bc.

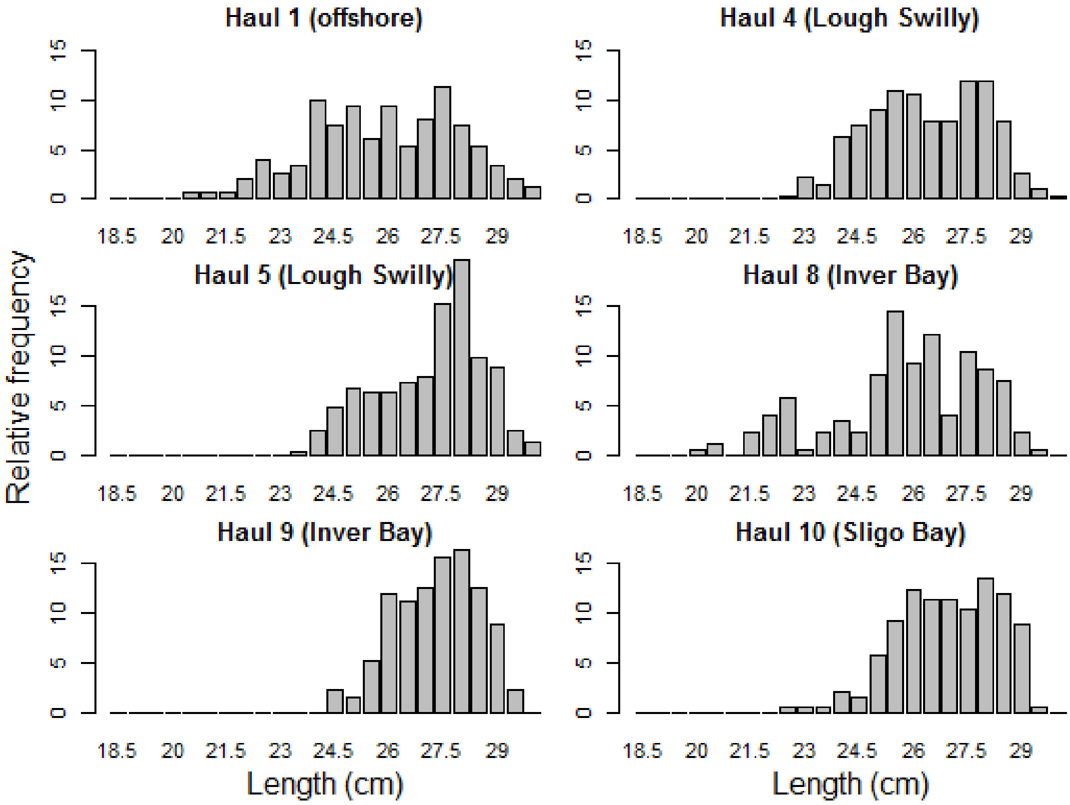

Figure 22. Length (cm) frequency distributions of herring in each haul in 6aS/7bc.

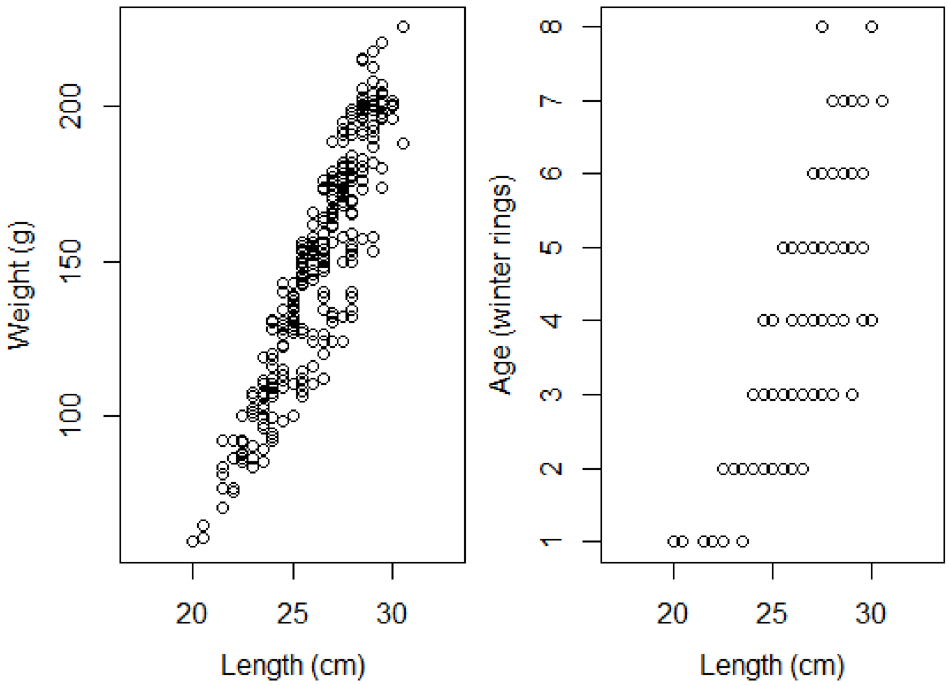

Figure 23. (a- upper panels) Age at length 6aN, (b – lower panels) 6aS/7bc

Maturity at age for 6aS/7bc herring is shown in Table 7. 74% of 1-wr herring were immature, and 0.02% of 2-wr herring were immature.

Table 7. Maturity at age for 6aS/7bc herring in 2016.

Age (wr)	Immature	Mature
1	74%	26%
2	0.02%	99.98%
3+	0%	100%

2.4 Abundance estimation

Biological data were used to estimate the abundance and biomass of herring in each strata according to length, age and maturity stage. In each section, the summary table for each area is followed by the details for each strata.

2.4.1 6aN (Tables 8 to 12)

Table 8. Total Abundance and overall biological composition of herring in 6a North from the acoustic survey. *Spawning herring is a subset of the mature herring.

Age	Abundance ('000s)	Mature	Spawning	Biomass (t)	Mean length (cm)	Mean weight (g)
1	4764	3%	0%	277	-	-
2	62298	98%	41%	8456	25.1	135.7
3	22221	100%	67%	3957	27.2	178.1
4	17828	100%	74%	3651	28.3	204.8
5	12393	100%	72%	2740	29.1	221.1
6	15779	100%	72%	3624	29.5	229.7
7	12829	100%	80%	3038	29.9	236.8
8	4466	100%	83%	1068	30.2	239.1
9	1775	100%	89%	455	30.9	256.4
10	583	100%	98%	145	30.7	249.7
11	7	100%	100%	1	31.5	197.0
12	32	100%	100%	8	30.0	262.0

13	0	-	-	0	-	-
14	32	100%	100%	9	30.5	278
Immature	6220	-	-	433	20.2	69.6
Mature	148712	-	-	26995	27.3	181.5
Spawning*	90208	-	-	17627	28.0	195.4
TOTAL	154942	96%	58%	27440	27.0	177.0

Table 9a. Overall length and age distribution for Area 2 North mainland.

Variable: Abundance
EstLayer: 1
Stratum: TOTAL
specialstage: TOTAL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23.0-23.5	256	-	-	-	-	-	-	-	-	-	256	27.1	105.59
23.5-24.0	748	-	-	-	-	-	-	-	-	-	748	83.2	111.27
24.0-24.5	1298	-	-	-	-	-	-	-	-	-	1298	150.2	115.75
24.5-25.0	2265	-	-	-	-	-	-	-	-	-	2265	282.6	124.77
25.0-25.5	3255	76	-	-	-	-	-	-	-	-	3331	435.4	130.73
25.5-26.0	3507	127	-	-	-	-	-	-	-	-	3634	512.1	140.91
26.0-26.5	3552	314	-	-	-	-	-	-	-	-	3866	580.3	150.10
26.5-27.0	2583	946	178	-	-	-	-	-	-	-	3706	596.9	161.08
27.0-27.5	1127	2147	533	-	-	-	-	-	-	-	3807	622.1	163.41
27.5-28.0	778	2194	863	42	-	-	-	-	-	-	3878	707.5	182.45
28.0-28.5	34	1889	1650	545	277	-	-	-	-	-	4394	849.9	193.42
28.5-29.0	-	697	3301	1228	77	283	-	-	-	-	5586	1152.3	206.28
29.0-29.5	-	412	1835	1572	2196	877	9	-	-	-	6901	1496.0	216.78
29.5-30.0	-	-	453	1960	2676	1454	652	-	-	-	7195	1616.8	224.72
30.0-30.5	-	-	349	823	1472	2928	824	6	356	-	6757	1560.3	230.90
30.5-31.0	-	-	300	267	1195	1488	894	322	-	-	4466	1104.3	247.28
31.0-31.5	-	-	80	522	399	372	399	574	-	-	2347	583.2	248.51
31.5-32.0	-	-	79	225	172	408	408	46	-	7	1345	342.2	254.48
32.0-32.5	4	-	-	-	-	158	149	153	42	-	506	144.7	285.61
32.5-33.0	-	-	-	-	-	86	-	-	39	-	125	31.4	251.96
33.0-33.5	-	-	-	-	9	36	-	4	-	-	50	14.9	301.39
34.0-34.5	-	-	-	-	-	-	-	-	40	-	40	12.0	300.00
TSN(1000)	19406	8801	9620	7184	8473	8090	3335	1107	477	7	66499	-	-
TSB(1000 kg)	2722.1	1564.4	1959.4	1597.5	1957.2	1893.8	804.6	288.1	116.9	1.4	-	12916.7	-
Mean length (cm)	25.49	27.42	28.51	29.36	29.66	30.04	30.43	31.02	30.71	31.50	-	-	-
Mean weight (g)	140.27	177.74	203.68	222.38	231.00	234.09	241.28	260.33	245.27	197.00	-	-	194.13

Table 9b. Biological composition of herring in Area 2 North mainland from the acoustic survey. *Is a subset of the mature herring.

Age	Abundance ('000s)	Mature	Spawning	Biomass (t)	Mean length (cm)	Mean weight (g)
1	0	-	-	0	-	-
2	19406	99%	87%	2722	25.5	140.3
3	8801	100%	94%	1564	27.4	177.7
4	9620	100%	95%	1959	28.5	203.7
5	7184	100%	95%	1598	29.4	222.4
6	8473	100%	88%	1957	29.7	231.0

7	8090	100%	91%	1894	30.0	234.1
8	3335	100%	95%	805	30.4	241.3
9	1107	100%	86%	288	31.0	260.3
10	477	100%	100%	117	30.7	245.3
11	7	100%	100%	1	31.5	197.0
Immature	196	-	-	23	25.5	115.2
Mature	**66295**	**-**	**-**	**12882**	**28.1**	**194.3**
Spawning*	60460	-	-	11757	28.1	194.5
TOTAL	66500	100%	91%	12917	28.1	194.1

Figure 10a. Overall length and age distribution for Area 3 The Minch.

Variable: Abundance
EstLayer: 1
Stratum: TOTAL
specialstage: TOTAL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
17.5-18.0	153	-	-	-	-	-	-	-	-	-	-	-	153	7.8	51.00
18.0-18.5	458	-	-	-	-	-	-	-	-	-	-	-	458	22.9	50.00
18.5-19.0	519	-	-	-	-	-	-	-	-	-	-	-	519	27.2	52.35
19.0-19.5	1833	-	-	-	-	-	-	-	-	-	-	-	1833	102.8	56.08
19.5-20.0	504	-	-	-	-	-	-	-	-	-	-	-	504	30.7	60.91
20.0-20.5	489	-	-	-	-	-	-	-	-	-	-	-	489	32.5	66.56
20.5-21.0	-	-	-	-	-	-	-	-	-	-	-	-	199	-	-
21.0-21.5	31	122	-	-	-	-	-	-	-	-	-	-	153	13.1	86.00
21.5-22.0	15	15	-	-	-	-	-	-	-	-	-	-	31	3.2	105.00
22.0-22.5	-	76	-	-	-	-	-	-	-	-	-	-	76	7.3	96.00
22.5-23.0	-	76	-	-	-	-	-	-	-	-	-	-	76	7.0	92.00
23.0-23.5	-	321	76	-	-	-	-	-	-	-	-	-	397	41.7	105.00
23.5-24.0	-	555	-	-	-	-	-	-	-	-	-	-	555	65.3	117.71
24.0-24.5	-	1424	-	-	-	-	-	-	-	-	-	-	1424	173.7	121.98
24.5-25.0	-	1531	-	48	-	-	-	-	-	-	-	-	1579	212.9	134.85
25.0-25.5	-	2181	358	-	-	-	-	-	-	-	-	-	2539	365.2	143.88
25.5-26.0	-	2344	429	-	-	-	-	-	-	-	-	-	2774	417.0	150.36
26.0-26.5	-	3014	510	-	-	-	-	-	-	-	-	-	3523	564.2	160.13
26.5-27.0	-	1403	444	484	-	-	-	-	-	-	-	-	2331	394.6	169.29
27.0-27.5	-	1217	1380	193	101	-	-	-	-	-	-	-	2891	518.8	179.48
27.5-28.0	-	393	1700	460	121	162	-	-	-	-	-	-	2836	531.6	187.42
28.0-28.5	-	-	1640	860	456	309	-	-	-	-	-	-	3265	664.9	203.66
28.5-29.0	-	-	545	931	301	578	170	160	-	-	-	-	2685	577.1	214.94
29.0-29.5	-	-	470	344	1127	1338	125	-	188	-	-	-	3593	803.4	223.59
29.5-30.0	-	-	162	647	939	777	550	-	-	-	-	-	3076	709.0	230.50
30.0-30.5	-	-	32	223	319	953	1127	-	41	32	32	-	2760	667.8	241.96
30.5-31.0	-	-	-	95	199	348	538	190	63	-	-	32	1466	373.0	254.45
31.0-31.5	-	-	-	94	31	125	197	31	218	31	-	-	727	185.7	255.33
31.5-32.0	-	-	-	-	-	305	153	-	31	31	-	-	519	144.5	278.35
32.0-32.5	-	-	-	-	-	99	66	66	33	-	-	-	264	80.5	305.00
32.5-33.0	-	-	-	-	-	62	31	-	94	-	-	-	187	55.5	296.33
33.0-33.5	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-
33.5-34.0	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-
TSN(1000)	4002	14672	7747	4379	3594	5057	2958	448	668	94	32	32	43683	-	-
TSB(1000 kg)	228.2	2151.6	1431.1	938.0	811.2	1182.3	738.4	110.6	166.9	25.5	8.4	8.8	-	7800.9	-
Mean length (cm)	18.97	25.35	27.30	28.33	29.04	29.50	30.08	30.04	30.61	30.82	30.00	30.50	-	-	-
Mean weight (g)	57.02	146.65	184.73	214.19	225.68	233.78	249.66	247.13	249.92	272.51	262.00	278.00	-	-	178.58

Table 10b. Biological composition of herring in Area 3 The Minch, from the acoustic survey. *Is a subset of the mature herring.

Age	Abundance ('000s)	Mature	Spawning	Biomass (t)	Mean length (cm)	Mean weight (g)
1	4002	0%	0%	228	19.0	57.0
2	14672	93%	61%	2152	25.4	146.7
3	7747	99%	72%	1431	27.3	184.7
4	4379	100%	69%	938	28.3	214.2
5	3594	100%	47%	811	29.0	225.7
6	5057	100%	64%	1182	29.5	233.8

7	2958	100%	86%	738	30.1	249.7
8	448	100%	93%	111	30.0	247.1
9	668	100%	94%	167	30.6	249.9
10	94	100%	100%	26	30.8	272.5
11						
12	32	100%	100%	8	30.0	262.0
13						
14	32	100%	100%	9	30.5	278.0
Immature	5061	-	-	340	19.8	67.2
Mature	38621	-	-	7461	27.6	193.2
Spawning*	26041	-	-	5142	27.8	197.5
TOTAL	43683	88%	60%	7801	26.7	178.6

Figure 11a. Length and age distribution for Area 4 Hebrides.

Variable: Abundance
EstLayer: 1
Stratum: TOTAL
specialstage: TOTAL

LenGrp	age 1	2	3	4	5	6	7	8	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
19.5-20.0	66	-	-	-	-	-	-	-	-	66	3.5	52.00
20.0-20.5	265	-	-	-	-	-	-	-	-	265	15.9	60.00
20.5-21.0	66	-	-	-	-	-	-	-	-	66	4.1	62.00
21.0-21.5	242	60	-	-	-	-	-	-	-	302	21.3	70.40
22.0-22.5	57	-	-	-	-	-	-	-	-	57	4.6	80.00
22.5-23.0	-	477	-	-	-	-	-	-	-	477	44.6	93.54
23.0-23.5	-	1766	-	-	-	-	-	-	-	1766	192.1	108.77
23.5-24.0	-	2474	-	-	-	-	-	-	-	2474	268.1	108.34
24.0-24.5	-	4994	-	-	-	-	-	-	-	4994	585.0	117.15
24.5-25.0	-	5415	-	-	-	-	-	-	-	5415	677.9	125.19
25.0-25.5	-	5513	-	39	-	-	-	-	-	5552	728.9	131.29
25.5-26.0	-	4020	345	-	-	-	-	-	-	4364	599.3	137.31
26.0-26.5	-	2207	1113	89	-	-	-	-	-	3409	515.5	151.19
26.5-27.0	-	1021	1620	85	-	-	-	-	-	2725	453.7	166.46
27.0-27.5	-	169	1479	776	-	27	-	-	-	2451	425.9	173.77
27.5-28.0	-	105	661	744	296	-	-	-	-	1806	330.2	182.89
28.0-28.5	-	-	88	784	392	790	89	-	-	2143	434.7	202.86
28.5-29.0	-	-	60	723	625	482	226	105	-	2221	459.9	207.02
29.0-29.5	-	-	208	354	33	35	831	289	-	1750	387.8	221.67
29.5-30.0	-	-	-	235	190	456	202	97	-	1179	263.7	223.74
30.0-30.5	-	-	98	-	80	236	338	62	-	815	190.4	233.72
30.5-31.0	-	-	-	-	-	114	39	108	12	273	63.9	234.15
31.0-31.5	-	-	-	-	-	111	10	21	-	142	34.9	245.70
31.5-32.0	-	-	-	-	-	-	46	-	-	46	13.4	290.00
TSN(1000)	630	28220	5673	3829	1615	2249	1781	683	12	44759	-	-
TSB(1000 kg)	41.3	3582.1	961.8	753.3	331.3	484.8	405.8	152.3	3.0	-	6719.1	-
Mean length (cm)	20.62	24.64	26.78	27.87	28.40	28.90	29.24	29.38	30.50	-	-	-
Mean weight (g)	65.47	126.93	169.53	196.75	205.13	215.55	227.86	223.04	248.00	-	-	150.12

Table 11b. Biological composition of herring in Area 4 Herbides, from the acoustic survey. *Is a subset of the mature herring.

AGE	Abundance ('000s)	% Mature	% Spawning	Biomass (t)	Mean length (cm)	Mean weight (g)
1	696	8%	0%	48	20.4	63.1
2	28220	99%	0%	3582	24.6	126.9
3	5673	100%	18%	962	26.8	169.5

4	3829	100%	27%	753	27.9	196.8
5	1615	100%	27%	331	28.4	205.1
6	2249	100%	32%	485	28.9	215.6
7	1781	100%	23%	406	29.2	227.9
8	683	100%	15%	152	29.4	223.0
9	0	-	-	0	-	-
10	12	100%	0%	3	30.5	248.0
Immature	963	-	-	71	21.3	73.2
Mature	43796	-	-	6652	25.8	151.8
Spawning*	3707	-	-	727	28.0	196.1
TOTAL	44759	98%	8%	6723	25.7	150.1

2.4.2 6aS/7bc (Table 13 to 17)

The estimated total stock biomass (TSB) of herring found in each of the survey areas (those that we are confident are 6aS/7bc herring) is shown in Tables 13-17. The TSB estimate for the combined 6aS/7bc area (Table 13) was 35,475 tonnes (Lough Swilly = 9,411 tonnes, Donegal Bay = 13,301 and the remaining NW area = 12,762 tonnes).

The transects in Lough Swilly were executed in a zig-zag pattern due to the shallow nature of the habitat, therefore for estimation purposes, Lough Swilly was treated as a separate strata within StoX. The entire survey area outside of Lough Swilly was treated as two strata with parallel transects with 3nmi spacing (one Donegal Bay strata, and one for the rest of the northwest (NW) area).

Table 13. Total 6aS/7bc age-disaggregated estimate of mature herring.

Variable: Abundance
EstLayer: 1
Stratum: TOTAL
SpecCat: Clupea herangus

LenGrp	age 1	2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20.0-20.5	333	-	-	-	-	-	-	-	333	19.7	59.00
20.5-21.0	735	-	-	-	-	-	-	-	735	45.2	61.55
21.0-21.5	-	-	-	-	-	-	-	-	-	-	-
21.5-22.0	1470	-	-	-	-	-	-	-	1470	121.6	82.71
22.0-22.5	2068	-	-	-	-	-	-	-	2068	168.1	81.30
22.5-23.0	1960	1467	-	-	-	-	-	-	3427	305.3	89.10
23.0-23.5	-	2748	-	-	-	-	-	-	2748	273.3	99.46
23.5-24.0	718	2763	-	-	-	-	-	-	3481	358.3	102.93
24.0-24.5	-	7603	434	-	-	-	-	-	8038	904.5	112.53
24.5-25.0	-	6485	3088	924	-	-	-	-	10497	1298.1	123.67
25.0-25.5	-	6335	6664	1340	-	-	-	-	14339	1896.0	132.23
25.5-26.0	-	3972	14941	-	1178	-	-	-	20091	2847.2	141.71
26.0-26.5	-	2457	15131	2396	890	-	-	-	20873	3104.8	148.75
26.5-27.0	-	225	15963	1737	3133	-	-	-	21057	3231.0	153.44
27.0-27.5	-	-	7060	6460	4313	957	-	-	18789	3156.1	167.97
27.5-28.0	-	-	7296	611	13353	1984	1027	1138	25409	4522.6	178.00
28.0-28.5	-	-	278	557	11816	12061	3401	-	28114	4993.2	177.60
28.5-29.0	-	-	-	966	4119	8532	7056	-	20673	4041.4	195.50
29.0-29.5	-	-	375	-	6232	7301	698	-	14606	2829.4	193.71
29.5-30.0	-	-	-	475	1033	1042	2313	-	4863	978.4	201.19
30.0-30.5	-	-	-	315	-	-	-	1106	1421	283.7	199.70
30.5-31.0	-	-	-	-	-	-	460	-	460	97.4	211.81
TSN(1000)	7284	34055	71229	15781	46066	31877	14956	2244	223491	-	-
TSB(1000 kg)	590.4	4057.6	10811.6	2529.1	8273.5	5922.8	2869.0	421.5	-	35475.4	-
Mean length (cm)	21.94	24.43	26.11	26.76	27.77	28.35	28.56	28.73	-	-	-
Mean weight (g)	81.05	119.15	151.79	160.27	179.60	185.80	191.84	187.87	-	-	158.73

Table 14. Lough Swilly area age-disaggregated estimate of mature herring in survey

Variable: Abundance
EstLayer: 1
Stratum: Swilly
SpecCat: Clupea herangus

LenGrp	age 2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20.0-20.5	-	-	-	-	-	-	-	-	-	-
20.5-21.0	-	-	-	-	-	-	-	-	-	-
21.0-21.5	-	-	-	-	-	-	-	-	-	-
21.5-22.0	-	-	-	-	-	-	-	-	-	-
22.0-22.5	-	-	-	-	-	-	-	-	-	-
22.5-23.0	174	-	-	-	-	-	-	174	15.8	91.00
23.0-23.5	955	-	-	-	-	-	-	955	99.3	104.00
23.5-24.0	913	-	-	-	-	-	-	913	100.1	109.60
24.0-24.5	3002	-	-	-	-	-	-	3002	334.7	111.50
24.5-25.0	1904	1142	762	-	-	-	-	3808	467.8	122.85
25.0-25.5	2200	1818	574	-	-	-	-	4592	621.8	135.42
25.5-26.0	1135	2931	-	851	-	-	-	4917	711.6	144.73
26.0-26.5	1136	2178	1515	-	-	-	-	4830	715.1	148.06
26.5-27.0	-	2413	1062	965	-	-	-	4441	684.7	154.20
27.0-27.5	-	1258	1355	1258	678	-	-	4550	765.2	168.19
27.5-28.0	-	3131	-	4011	-	-	-	7142	1258.7	176.23
28.0-28.5	-	-	-	4657	2873	594	-	8125	1440.8	177.33
28.5-29.0	-	-	686	1274	1470	1470	-	4900	975.7	199.14
29.0-29.5	-	203	-	2741	609	-	-	3553	692.9	195.03
29.5-30.0	-	-	302	302	504	504	-	1613	322.6	200.06
30.0-30.5	-	-	207	-	-	-	621	829	165.6	199.88
30.5-31.0	-	-	-	-	-	174	-	174	39.2	226.00
TSN(1000)	11418	15075	6463	16060	6134	2742	621	58514	-	-
TSB(1000 kg)	1412.5	2333.1	1008.9	2868.7	1118.5	546.2	123.8	-	9411.7	-
Mean length (cm)	24.48	26.18	26.58	27.81	28.23	28.70	30.00	-	-	-
Mean weight (g)	123.70	154.77	156.09	178.62	182.35	199.20	199.17	-	-	160.84

Table 15. Northwest area age-disaggregated estimate of mature herring in survey

Variable: Abundance
EstLayer: 1
Stratum: NW
SpecCat: Clupea herangus

LenGrp	age 1	2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20.0-20.5	110	-	-	-	-	-	-	-	110	6.5	59.00
20.5-21.0	289	-	-	-	-	-	-	-	289	18.0	62.40
21.0-21.5	-	-	-	-	-	-	-	-	-	-	-
21.5-22.0	578	-	-	-	-	-	-	-	578	46.7	80.90
22.0-22.5	730	-	-	-	-	-	-	-	730	59.9	82.15
22.5-23.0	623	736	-	-	-	-	-	-	1359	121.6	89.50
23.0-23.5	-	1349	-	-	-	-	-	-	1349	132.3	98.04
23.5-24.0	162	1293	-	-	-	-	-	-	1455	149.6	102.81
24.0-24.5	-	2823	101	-	-	-	-	-	2924	323.9	110.78
24.5-25.0	-	2980	1084	163	-	-	-	-	4226	516.7	122.28
25.0-25.5	-	2522	2312	420	-	-	-	-	5254	683.9	130.18
25.5-26.0	-	2127	5016	-	327	-	-	-	7470	1036.8	138.80
26.0-26.5	-	1321	4842	880	275	-	-	-	7319	1073.6	146.70
26.5-27.0	-	225	5738	675	1069	-	-	-	7707	1166.6	151.38
27.0-27.5	-	-	2289	2345	1675	279	-	-	6589	1101.2	167.13
27.5-28.0	-	-	3039	110	4586	608	276	387	9005	1573.3	174.71
28.0-28.5	-	-	278	557	3787	4567	1058	-	10248	1765.5	172.27
28.5-29.0	-	-	-	280	1233	2971	2859	-	7343	1423.5	193.87
29.0-29.5	-	-	172	-	2234	2291	573	-	5269	1009.0	191.49
29.5-30.0	-	-	-	173	460	403	863	-	1899	377.0	198.52
30.0-30.5	-	-	-	108	-	-	-	484	592	118.1	199.45
30.5-31.0	-	-	-	-	-	-	286	-	286	58.1	203.20
TSN(1000)	2491	15375	24871	5712	15647	11119	5915	871	82000	-	-
TSB(1000 kg)	199.9	1789.3	3752.8	917.5	2789.0	2035.8	1112.8	164.8	-	12762.0	-
Mean length (cm)	21.84	24.48	26.17	26.88	27.78	28.34	28.65	28.89	-	-	-
Mean weight (g)	80.26	116.38	150.89	160.64	178.25	183.10	188.13	189.17	-	-	155.63

Table 16. Donegal Bay area age-disaggregated estimate of mature herring in survey

Variable: Abundance
EstLayer: 1
Stratum: Donegal Bay
SpecCat: Clupea herangus

LenGrp	age 1	2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20.0-20.5	223	-	-	-	-	-	-	-	223	13.2	59.00
20.5-21.0	446	-	-	-	-	-	-	-	446	27.2	61.00
21.0-21.5	-	-	-	-	-	-	-	-	-	-	-
21.5-22.0	892	-	-	-	-	-	-	-	892	74.8	83.88
22.0-22.5	1338	-	-	-	-	-	-	-	1338	108.2	80.83
22.5-23.0	1337	557	-	-	-	-	-	-	1894	167.9	88.65
23.0-23.5	-	444	-	-	-	-	-	-	444	41.8	94.00
23.5-24.0	557	557	-	-	-	-	-	-	1114	108.7	97.60
24.0-24.5	-	1778	333	-	-	-	-	-	2112	245.9	116.42
24.5-25.0	-	1601	862	-	-	-	-	-	2463	313.5	127.30
25.0-25.5	-	1613	2535	346	-	-	-	-	4494	590.3	131.36
25.5-26.0	-	711	6993	-	-	-	-	-	7704	1098.7	142.62
26.0-26.5	-	-	8110	-	614	-	-	-	8725	1316.1	150.85
26.5-27.0	-	-	7811	-	1098	-	-	-	8910	1379.7	154.85
27.0-27.5	-	-	3512	2759	1380	-	-	-	7651	1289.7	168.57
27.5-28.0	-	-	1126	501	4756	1377	751	751	9261	1690.6	182.55
28.0-28.5	-	-	-	-	3372	4621	1748	-	9741	1787.0	183.45
28.5-29.0	-	-	-	-	1612	4091	2728	-	8431	1642.2	194.79
29.0-29.5	-	-	-	-	1257	4401	126	-	5784	1127.5	194.93
29.5-30.0	-	-	-	-	270	135	946	-	1351	278.8	206.30
TSN(1000)	4794	7262	31283	3606	14359	14625	6298	751	82978	-	-
TSB(1000 kg)	390.5	855.7	4725.6	602.7	2615.8	2768.5	1210.0	132.9	-	13301.7	-
Mean length (cm)	21.99	24.26	26.04	26.88	27.71	28.41	28.40	27.50	-	-	-
Mean weight (g)	81.46	117.84	151.06	167.16	182.17	189.30	192.11	177.00	-	-	160.31

The results of the uncertainty estimates (CV) for 6aS/7bc are shown in Table 14. The CV estimates are high (~0.37) for the survey in 2016.

Table 17. 6aS/7bc uncertainty estimates (with CV) by weight and number for the Northwest area, Lough Swilly and the total survey area.

```
[1] "Ton by stratum"
       Stratum   Ton.5%    Ton.50%   Ton.95%  Ton.mean    Ton.sd    Ton.cv
1: Donegal Bay  202.739 13218.068 32029.31 12868.935 10675.991 0.8295940
2:          NW 4230.325 12282.814 22892.13 12828.311  5850.342 0.4560493
3:      Swilly    0.000  9378.993 17740.96  8386.831  6637.282 0.7913933
[1] "Total number by stratum (mill)"
       Stratum Ab.Sum.5% Ab.Sum.50% Ab.Sum.95% Ab.Sum.mean Ab.Sum.sd Ab.Sum.cv
1: Donegal Bay   1306613   82439879  210051435    82527602  70348423 0.8524230
2:          NW  26305359   78078760  146238986    82496633  37943474 0.4599397
3:      Swilly         0   56987956  113311721    52143917  41373715 0.7934524
[1] "Ton by survey"
     Ton.5%  Ton.50%  Ton.95% Ton.mean   Ton.sd    Ton.cv
1: 14406.75 33856.86 54702.04 34084.08 12680.88 0.3720471
[1] "Total number by survey (mill)"
   Ab.Sum.5% Ab.Sum.50% Ab.Sum.95% Ab.Sum.mean Ab.Sum.sd Ab.Sum.cv
1:  91951196  214361102  352422737   217168152  81122699 0.3735479
```

2.4.3 Bias considerations

Bias Considerations	Comment
6.1 Directed movement of fish with respect to the survey tracks	No strong directed movement at this time that would make the 'flow' of herring across the strata greater than within. Pre-spawning and spawning aggregations.
6.2 Avoidance effect	unquantified
6.3 Overlapping survey layers	NA
6.4 Shallow water	NA Future design needs to be considered in inshore areas (e.g. Lough Swilly). Currently separate strata. There was good evidence of offshore containment in 6aS/7bc, however, stock was not contained inshore due to hyper-aggregating behaviour and shallow distribution (<10m) in some areas.
6.5 Water temperature and the propagation of the sonar beam	No problems?
6.6 Quality of raw material used	Good weather throughout all suvreys in 2016. Good quality raw data from calibrated scientific equipment
6.7 Accuracy of calibration constant	Good calibration

6.8 Biomass species composition	Trawl information, results from monitoring fishery and acoustic expert agreement
6.9 The actual accuracy problem of acoustic surveys	See CV estimates

2.4.4 Comparing towed-body and hull-mounted echo sounders

After the survey the acoustic data sets of the hull-mounted transducer and the towed-body transducer were scrutinized to determine the NASC per measure point. In area two, 30 transects were measured, each consisting of several measure points. In Table 18 is the total of all transect means (TTM) displayed, which shows on average a higher NASC for the towed-body transducer. Also the sum of all NASC that was measured with the hull-mounted- and towed-body transducer (SOM) is showed in this table, and appears to be higher at the towed body measurements.

Table 18. Overview of towed-body and hull-mounted NASC

	Transects	TTM (NASC)	SOM (NASC)
Towed-body	30	2783,6	32126,2
Hull-mounted	30	2269,5	26688,1

This table shows the comparison between the towed-body data and hull-mounted data. For both 30 transects were measured, for which the total transect mean (TTM) is displayed. This was calculated by taking the mean NASC of each transect and sum all 30 means. The sum of all NASC measured (SOM) is showed in the last column and was calculated by summing all NASC that was measured in all measure points of all transects.

From the 30 transects that were acoustically measured, 22 transects showed a higher mean NASC by the towed-body transducer. The other eight transects showed a higher mean NASC with use of the hull-mounted transducer. Figure 24 shows the mean NASC per transect measured by both transducers.

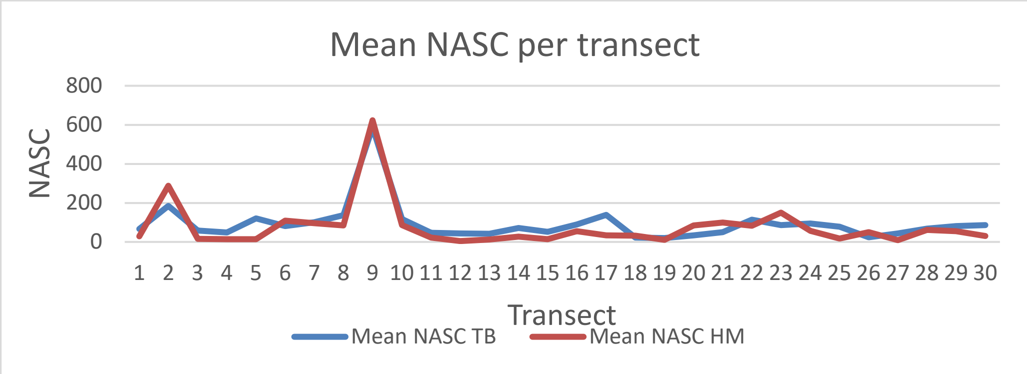

Figure 24. Mean NASC per transect measured by the towed-body transducer (TB, blue line) and the hull-mounted transducer (HM, red line).

3 Recommendations for data users

3.1 6aN

The acoustic surveys in the three strata surveyed in 6aN are considered to:

1. Contain the principal active spawning areas advised by ICES (29 April 2016) and the locations of reported commercial fishing activity conducted in August-September in recent years.
2. Provide a reliable estimate of
    a. the biomass of all herring at age observed in the 3 survey areas
    b. the minimum biomass of mature herring at age (Stages 2-5 on the ICES 6 pt maturity scale, ICES 2011)
    c. the minimum biomass of actively spawning herring (those that we are confident are 6aN herring, stages 3-4 on the ICES 6 pt maturity scale, ICES 2011)

The survey has particular value in relation to

- Providing a platform to continue work on stock splitting and stock ID in the greater Malin Shelf area (to be considered in ICES WKSIDAC)
- Providing a new index of 6aN SSB and monitoring changes in the timing of spawning and distribution at this time of year.
- Considering the appropriateness of a scientific monitoring TAC in 6aN, because the 6aN SSB estimate is a component of the estimates of the total stock estimated by the MALIN shelf/ WoS herring acoustic survey.
- Map in detail the spawning locations in 6aN, which is useful in relation to marine spatial planning considerations.
- Promoting positive example of industry-science and developing industry’s skills to assess pelagic stocks.

3.2 6aS/7bc

The acoustic survey in 6aS/7b was considered to:

- Be a minimum estimate of herring in the 6aS/7b survey area at the time of the survey
- Not contain the herring stock inshore due to the inshore distributions observed on the survey and reported in the fishery

- Have high confidence that the herring surveyed were 6aS/7b fish due to the inshore distribution and maturity stages of the fish sampled
- Be a good first data point of a time-series, were the survey to be continued in the future
- Reflect what was experienced in the monitoring fishery at the same time

The survey has particular value in relation to

- Being a good proof of concept that Industry/science partnership is a suitable way to survey this stock, including calibration of hull mounted transducers (38 and 120kHz) of the industry vessel at pier in Killybegs
- Providing a new index of 6aS/7b SSB for the surveyed area
- Providing a platform to continue work on splitting and stock ID in the greater Malin Shelf area (to be considered in ICES WKSIDAC)
- Documenting changes in the timing of spawning and distribution at this time of year and information on pre-spawning behaviour in inshore areas.

4 Recommendations for future surveys

4.1 6aN

- Consider evidence for timing and spawning locations since missing the peak in timing is the biggest risk.
- Allow time for adaptation of survey to map high intensity areas, particularly in the case of active spawning aggregations. The position of these localised aggregations needs to be determined and a small area around it defined, which subsequently needs to be covered with a tighter transect spacing. If time is available, it may also be useful to initially perform a non-systematic scouting survey to get an idea of the distribution/location of fish in the survey area. Based on the results, the survey area could then be split into appropriately sized strata which can be covered with necessary variable survey effort.
- Consider if calibration at the quay side (stern on) is an option for commercial vessels.
- Seek to ensure that industry vessels are equipped with smaller nets typically used in scientific surveys and appropriate echosounder with heave compensation.
- Ensure that any future surveys follow standard protocols whereby all fish recordings (even of non-commercial size) encountered on the echogram be sampled regularly. This is paramount to improve analysis of the acoustic data and accuracy of the estimated abundance and stock composition for different species in the survey area

4.2 6aS/7bc

- Survey in 2017 and beyond – consider whether using part of the monitoring TAC for herring to fund the acoustic part of the survey best use of this resource.
- Need to reduce uncertainty of estimate through better survey design and strata delineation. The estimates in 2016 relied heavily on herring aggregations from a few areas, resulting in a high cv (~0.37)
- Design – stock not contained inshore in 2016,
    - Survey timing
    - better if schools more widely distributed, before inshore aggregating behaviour is apparent, or a design that deals with the inshore behaviour during this time

    - Net/vessel – smaller net needed to fish in shallow areas if this behaviour is evident in future
    - Inshore design/smaller vessel perhaps more appropriate
- Using samples from fishery useful, but not ideal – more trawl samples containing herring is needed during the survey
- Need to develop protocols surrounding mini-surveys, particularly when large aggregations or hyper aggregating behaviour is observed (i.e. in areas like Lough Swilly)

Acknowledgements

Skipper and crew of the Atlantic Challenge, Unity, Annie Hillina, Zephyr, Quantus, Wirons.

Echomaster Marine, Peterhead.

Barry Electronics, Killybegs, Co. Donegal

Killybegs Fishermen's Organisation (KFO)

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Appendices

Appendix 1. 38kHz and 120kHz calibration results for Atlantic Challenge 29/11/2016

```
Calibration  Version   2.1.0.12

Date:  29.Nov.2016

Comments:
  38kHz morning 29/11/2016

Reference Target:
  TS                  -42.40 dB       Min. Distance          8.00 m
  TS Deviation           5.0 dB       Max. Distance         12.00 m

Transducer:  ES38B  Serial No.   38
  Frequency            38000 Hz       Beamtype              Split
  Gain                 25.54 dB       Two Way Beam Angle   -20.6 dB
  Athw. Angle Sens.       21.90       Along. Angle Sens.      21.90
  Athw. Beam Angle     6.96 deg       Along. Beam Angle     6.89 deg
  Athw. Offset Angle   0.16 deg       Along. Offset Angle -0.09 deg
  SaCorrection         -0.67 dB       Depth                3.00   m

Transceiver:  GPT  38 kHz 009072016d9f 1-1 ES38B
  Pulse Duration       1.024 ms       Sample Interval     0.191   m
  Power                 2000  W       Receiver Bandwidth   2.43 kHz

Sounder Type:
  EK60 Version  2.2.1

TS Detection:
  Min. Value           -50.0 dB       Min. Spacing            100 %
  Max. Beam Comp.        6.0 dB       Min. Echolength          80 %
  Max. Phase Dev.          8.0        Max. Echolength         180 %

Environment:
  Absorption Coeff.   9.3 dB/km       Sound Velocity     1491.8 m/s

Beam Model results:
  Transducer Gain    = 25.69 dB       SaCorrection        = -0.67 dB
  Athw. Beam Angle   = 6.95 deg       Along. Beam Angle   = 6.95 deg
  Athw. Offset Angle = 0.11 deg       Along. Offset Angle=-0.02 deg

Data deviation from beam model:
  RMS =     0.25 dB
  Max =     2.21 dB  No. =    12  Athw. =  2.1 deg  Along =  1.5 deg
  Min =    -1.58 dB  No. =   237  Athw. =  0.7 deg  Along = -1.5 deg

Data deviation from polynomial model:
  RMS =     0.23 dB
  Max =     2.12 dB  No. =    12  Athw. =  2.1 deg  Along =  1.5 deg
  Min =    -1.52 dB  No. =   237  Athw. =  0.7 deg  Along = -1.5 deg
```

```
Calibration  Version   2.1.0.12

Date:  29.Nov.2016

Comments:
  120kHz_20161129

Reference Target:
  TS                     -39.48 dB       Min. Distance          8.00 m
  TS Deviation             5.0 dB        Max. Distance         12.00 m

Transducer:  ES120-7   Serial No.   120
  Frequency            120000 Hz         Beamtype                Split
  Gain                  25.70 dB         Two Way Beam Angle    -20.8 dB
  Athw. Angle Sens.      21.00           Along. Angle Sens.      21.00
  Athw. Beam Angle      7.10 deg         Along. Beam Angle     7.10 deg
  Athw. Offset Angle    0.00 deg         Along. Offset Angle   0.00 deg
  SaCorrection          0.00 dB          Depth                 3.00   m

Transceiver:  GPT 120 kHz 009072034686 2-1 ES120-7
  Pulse Duration        1.024 ms         Sample Interval     0.191   m
  Power                  500  W          Receiver Bandwidth    3.03 kHz

Sounder Type:
  EK60 Version  2.2.1

TS Detection:
  Min. Value             -50.0 dB        Min. Spacing            100 %
  Max. Beam Comp.          6.0 dB        Min. Echolength          80 %
  Max. Phase Dev.          8.0           Max. Echolength         180 %

Environment:
  Absorption Coeff.  35.9 dB/km          Sound Velocity     1491.8 m/s

Beam Model results:
  Transducer Gain     = 26.63 dB         SaCorrection         = -0.31 dB
  Athw. Beam Angle    = 7.10 deg         Along. Beam Angle    = 7.23 deg
  Athw. Offset Angle  = 0.13 deg         Along. Offset Angle= 0.06 deg

Data deviation from beam model:
  RMS =     0.28 dB
  Max =     1.22 dB  No. =    98  Athw. = -1.5 deg  Along =  1.5 deg
  Min =    -3.04 dB  No. =   276  Athw. = -3.6 deg  Along =  3.5 deg

Data deviation from polynomial model:
  RMS =     0.24 dB
  Max =     1.08 dB  No. =    98  Athw. = -1.5 deg  Along =  1.5 deg
  Min =    -2.59 dB  No. =   276  Athw. = -3.6 deg  Along =  3.5 deg
```

Appendix 2. Example vessel survey manual (Quantus) (available on request)

Annex 5h: Rügen Herring Larvae Survey (RHLS)

P. Polte, R. Oeberst, T. Gröhsler, TI-OF

2016 Western Baltic spring spawning herring recruitment monitored by the Rügen Herring Larvae Survey

The waters of Greifswald Bay (ICES area 24) are considered a major spawning area of Western Baltic spring spawning (WBSS) herring. The German Thünen Institute of Baltic Sea Fisheries (TI-OF), Rostock, and its predecessor monitors the density of herring larvae as a vector of recruitment success since 1977 within the framework of the Rügen Herring Larvae Survey (RHLS). It delivers a unique high-resolution dataset on the herring larvae ecology in the Western Baltic, both temporally and spatially. Onboard the research vessel "FFS Clupea" a sampling grid including 35 stations is sampled weekly using ichthyoplankton gear (Bongo-net, mesh sizes 335 µm; 780 µm) during the main reproduction period from March to June. The weekly assessment of the entire sampling area is conducted within two days (detailed description of the survey design can be found in Polte 2013, ICES WD08). The collected data provide an important baseline for detailed investigations of spawning and recruitment ecology of WBSS herring spawning components. As a fishery-independent indicator of stock development, the recruitment index is incorporated into the assessment of the ICES Herring Assessment Working Group.
The rationale for the *N20* recruitment index is based on regular and strong correlations between the amount of larvae reaching a length of 20 mm (TL) in Greifswald Bay and abundance data of juveniles (1wr and 2 wr fish) as determined by acoustic surveys in the Arkona and Belt Seas (GERAS).
Those recurring correlations (N20/GERAS, 1-wr; 1992-2015 R^2=0.70) support the underlying hypotheses that i) major variability of natural mortality occurs at early life stages before larvae reach a total length of 20 mm and ii) larval herring production in Greifswald Bay is an adequate proxy for annual recruitment strength of the WBSS herring stock. The *N20* recruitment index is calculated every year based on data obtained from the RHLS. This is done by estimating weekly growth of larvae for seasonal temperature change and taking the sum of larvae reaching 20 mm by every survey week until the end of the investigation period. On the spatial scale, the 35 sampling stations are assigned to 5 strata and mean values of stations for each stratum are extrapolated to the strata area (for details see Oeberst et. al 2009). The sum of *N20* larvae caught over the investigation period in the entire area results in the *N20* recruitment index for those herring that enter the fishery as adults two to three years later.
Calculation procedures have been reviewed and re-established in 2007 and the recalculated index for the time series from 1991 onwards is used by HAWG since 2008 as 0-group recruitment index for the assessment of Western Baltic Spring Spawning herring.

2016 N20 index results:

With an estimated product of 442 million larvae, the 2016 *N20* recruitment index represents the **record low** in the 25 year time series (with a difference of 97 million larvae compared to the former low in 2014) (Table 1, Figure 1).

The reasons for the record low larvae production in Greifswald Bay are not yet fully understood and are subject of current research. However, field observations on the spawning beds hint on irregularities in egg distribution (i.e. eggs absent from formerly highly frequented spawning beds). Additionally, mild winter conditions in combination with generally high nutrient loads resulted in increased biomass of filamentous brown algae (*Pilayella littoralis*) from the very beginning of the spawning season. *Pilayella spp.* evidently increases herring egg mortality (Aneer 1987, v. Nordheim unpublished) and could have potentially affected egg survival in spring 2016 to an exceptionally high extent.

Similar to the previous year, March was the major period for the gill net fishery in Greifswald Bay due to the exceptionally mild winter conditions. Therefore the gill net fishery fulfilled its quota by April 22nd despite a 18% quota increase relative to 2015. The regular Rügen-Herringlarvae Survey larvae survey was conducted from March 10th to June 26th , over a 15 weeks period.

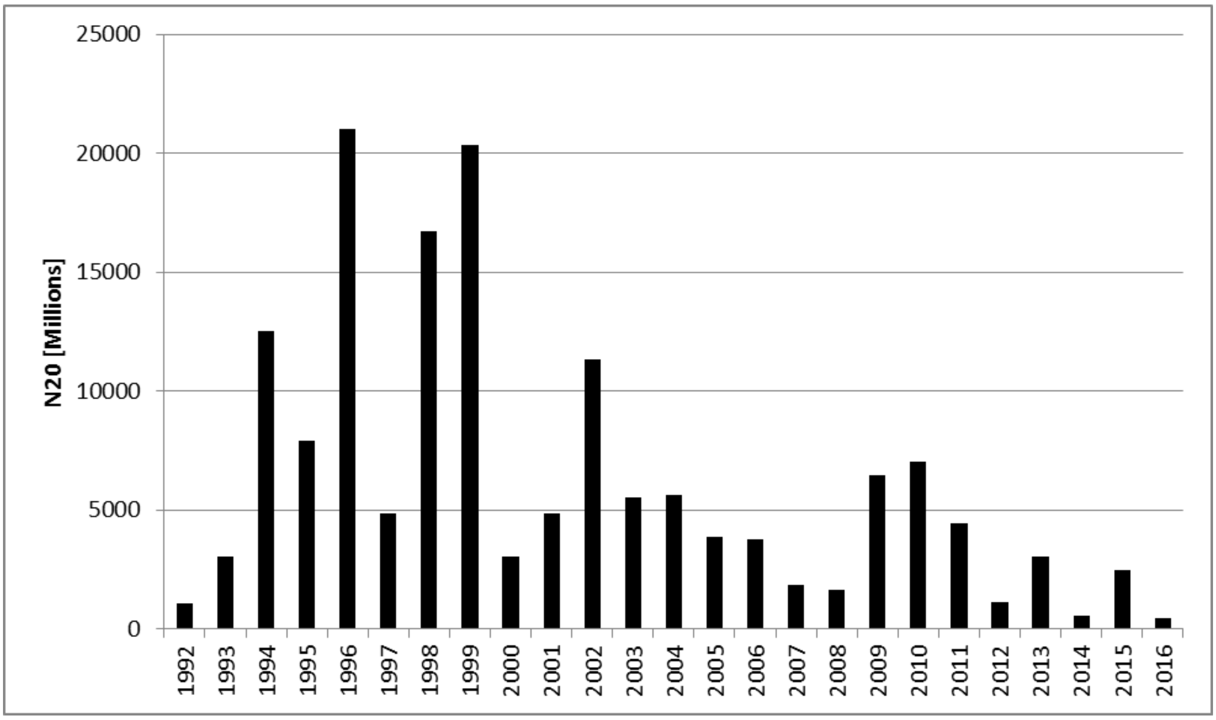

Figure 1 Validated RHLS time series with N20 index data presented as annual sum of 20 mm larvae in millions.

Table 1: *N20* larval herring index for spring spawning herring of the Western Baltic Sea (WBSS), generated by RHLS data.

Year	N20 (Mill)
1992	1060
1993	3044
1994	12515
1995	7930
1996	21012
1997	4872
1998	16743
1999	20364
2000	3026
2001	4845
2002	11324
2003	5507
2004	5640
2005	3887
2006	3774
2007	1829
2008	1622
2009	6464
2010	7037
2011	4444
2012	1140
2013	3021
2014	539
2015	2478
2016	**442**

Revision of the relation between N20 and GERAS 1-wr herring after years with low larvae production

Because of the one-year lag phase between the N20 and GERAS 1-wr. the relation cannot yet be validated for the 2016 N20. However, since recent years- and especially 2014- showed exceptionally low N20 values, it is worthwhile to test whether those years produced outliers in the time series of life-stage correlations or whether those relations hold up strong. Along the early life ontogeny the obvious process would be to include the relation between larvae and 0-group fish of the respective year into the analysis. However, the GERAS is not considered to deliver an quantitatively adequate index for the 0-group as most young-of –the-year juveniles remain to far inshore to be assessed by ocean going surveys. Despite the record low N20 in 2014 the strong correlation with the 1-wr group in the Western Baltic Sea remained valid, indicating that recruitment is not independent of larval herring production in Greifswald Bay (Fig. 2)

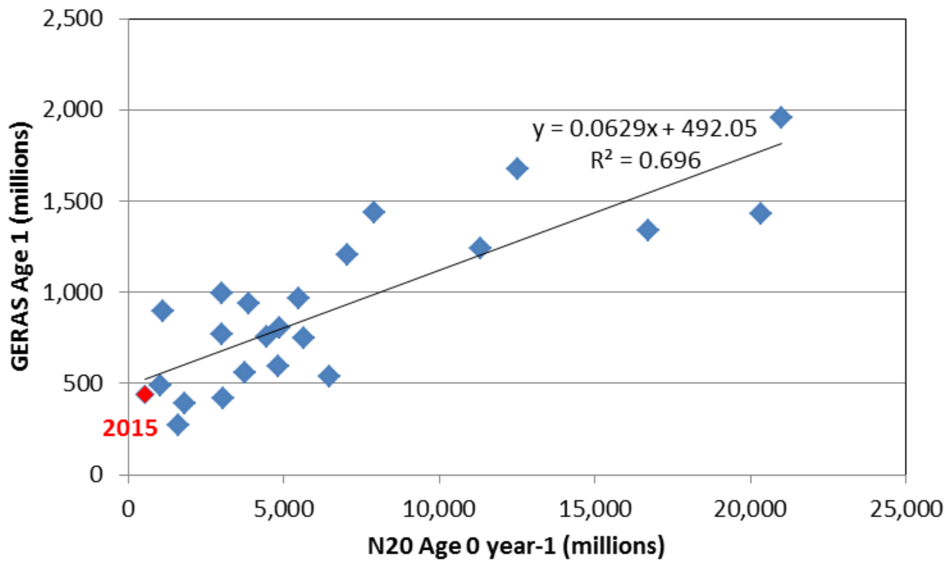

Figure 2 Correlation of 1-wr herring from GERAS with the N20 larvae index. Note: The one-year lag phase between indices. E.g. the exceptionally low N20 year 2014 is represented by the GERAS 1-wr index 2015.

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Annex 6: Survey Planning

IBWSS

Four vessels representing the Faroe Islands, the Netherlands (EU), Ireland (EU) and Norway are scheduled to participate in the 2017 blue whiting spawning stock survey.

Survey timing and design were discussed during the 2016 IBWSS post-cruise and 2017 WGIPS meetings. The group decided that in 2017, the survey design should follow the principle of the one used during the last survey Last year area 2 was covered by longitudinal transects perpendicular to the slope. The focus will still be on a good coverage of the shelf slope in survey areas 2 and 3 (Figure A6.1.)

The design is based on variable transect spacing, ranging from 30 nm in areas containing less dense aggregation (areas 1 and 5), to 20 nm in the core survey area (area 2, 3 and 4) (Figure A6.1.). The western borders of the transects in area 3 are set to 12°W in order to cover potential blue whiting aggregations extending further from the continental slope into the Rockall Trough. Transects are drawn systematically with a random start location.

The aim is to have three vessels surveying on their transects in area 3 at the same time. That way, the core survey area 3 can be covered synoptically by several vessels with similar temporal progression.

It was decided that the Dutch and Irish vessels would start the survey in the southern areas. 3–4 days after beginning their individual surveys, these vessels will be joint by the Norwegian vessel progressing northwards. Once the Norwegian vessel has finished surveying area 3 and 5, it will continue northwards into the Faroese-Shetland channel, area 4, and continue coverage in a northeastern direction. The Faroese vessel will primarily survey area 4 (Faroese/Shetland) and join the other vessels in the north of area 3 once they are present there towards the end of the survey period. The Rockall area will be covered by the Irish, Dutch and Norwegian vessels, starting in the south, progressing northward. Survey extension in terms of coverage (51–61ºN) will be in line with the previous year to ensure containment of the stock and survey timing will also remain fixed as in previous years.

Key will be to achieve coverage of area 3 in a consistent temporal progression between vessels. It is therefore very important that all vessels covering the core Hebrides area are present on station in the north of area 2 (just north of Porcupine Bank) on 24.-25. March 2017. Nonetheless, if some vessels are found to lag behind others, the 20 n.m. transect spacing will allow for adaptation of the survey design without great loss of coverage. For instance, this may mean either skipping or extending some of the horizontal transects to catch up or keep pace with the other vessels. Biological sampling should be carried out following methods normally applied to sampling acoustic registrations.

If registrations of blue whiting marks are continuing at the end of any planned transects, the length of these transects should be extended until no more marks are registered for a distance of 3 n.m. (or 20 minutes at normal survey speed). The transect at the outer western boarder can be cut off, if no registration of blue whiting for 5 n.m.

Preliminary cruise tracks for the 2017 survey are presented in. Survey coordinators in 2017, Ebba Mortensen (EM) and Leon Smith (LS) (Faroe Islands) has been tasked with coordinating contact between participants (EM) prior to and (LS) during the survey. Detailed cruise lines for each ship are uploaded on the WGPIPS sharepoint (/2017 Meeting docs/Background documents/Survey Plans 2017/IBWSS 2017).

As the survey is planned with inter-vessel cooperation in mind it is vitally important that participants stick to the planned transect positioning.

Participants are also required to use the logbook system for recording course changes, CTD stations and fishing operations. The survey will be carried out according to survey procedures described in the ICES WGIPS Manual for Acoustic Surveys.

Table A6.1. Individual vessel dates for the active surveying period in the 2017 International Blue Whiting Spawning stock Survey (IBWSS).

SHIP	NATION	ACTIVE SURVEYING TIME (DAYS)	DEFINITIVE SURVEYING DATES
Celtic Explorer	Ireland (EU)	15	21.3.2017 – 4.4.2017
Hired vessel	Norway	14	23.3.2017 – 5.4.2017
Tridens	Netherlands (EU)	15	21.3.2017 – 4.4.2017
Magnus Heinason	Faroes	12	31.3.2017 –10.4.2017

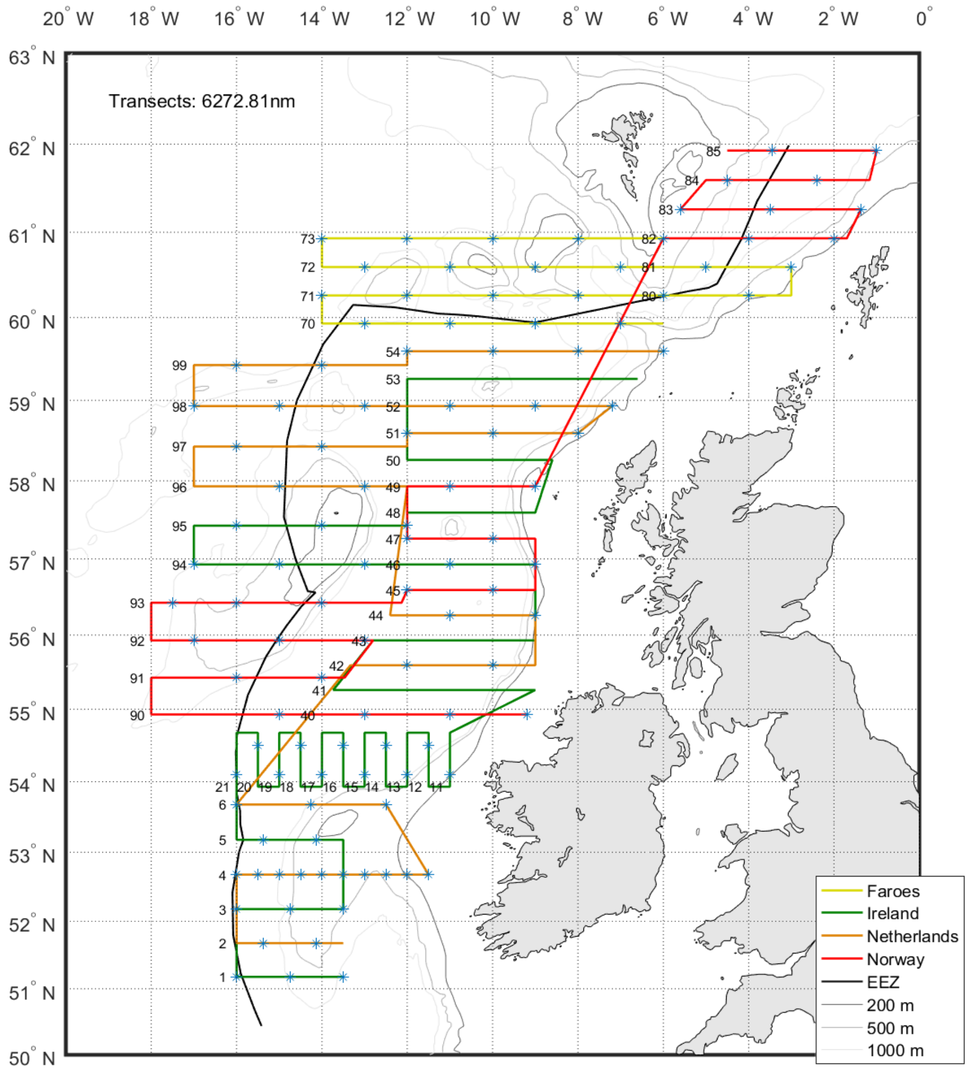

Figure A6.1. Planned survey tracks for the combined 2017 International Blue Whiting Spawning stock Survey (IBWSS).

IESNS

Denmark (EU-coordinator), Faroe Islands, Iceland, Russia and Norway will participate in the IESNS survey in April-June 2017. Ships and preliminary dates are given in Table A6.2. Survey days exclude time for: hydrographic cross sections, coverage outside the IESNS area and crew change. As in the two previous years, the plan is to use a stratified systematic transect design with random starting points. The suggested transects in each stratum are shown in Figure A6.2. Compared with last year, more survey effort is put into stratum 2 and little less in stratum 1 and 4. In addition, Norway will cower two rows of transects across the Norwegian Sea (between Iceland and Norway) in order to collect plankton data from this "cross section". Norway will be the survey coordinator during the cruise. A post-cruise meeting is suggested to be held 20-22 June 2017 in Bergen, Norway.

Table A6.2. Individual vessel dates for the active surveying period in the 2017 IESNS.

Ship	Nation	Dates (harbour to harbour)	Effective survey days	Crew change
Dana	**Denmark (EU)**	**25 Apr – 24 May**	**23**	**8-9 May, Bodø**
Magnus Heinason	**Faroe Islands**	**4 May – 15 May**	**10**	
Árni Friðriksson	**Iceland**	**5 May – 24 May**	**19**	
G.O. Sars	**Norway**	**3 May – 6 June**	**29**	**23-24 May, Tromsø**
Fridtjof Nansen	**Russia**	**15 May – 5 June**	**20**	

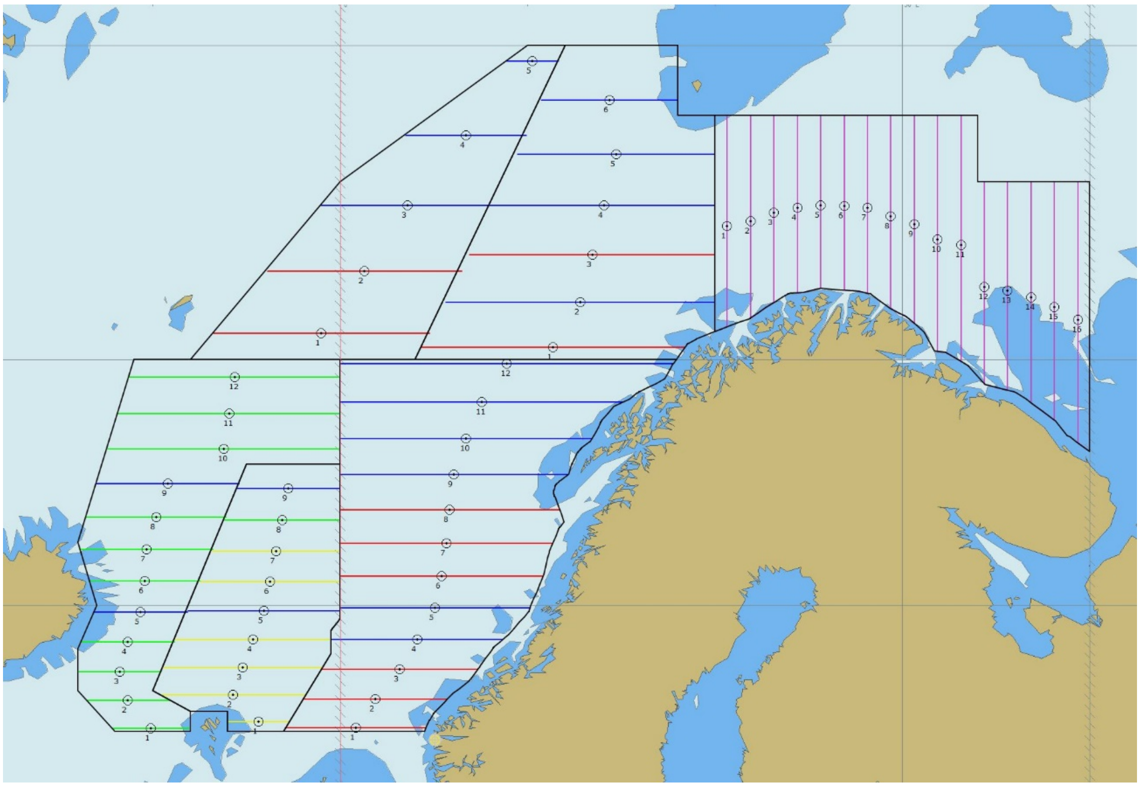

Figure A6.2. Suggested transects for the IESNS survey in 2017. Colors represent the different vessels/nations (yellow: FO, green: IS, dark blue: NO, red: EU, purple: RU).

<u>IESSNS</u>

The International Ecosystem Summer Survey in the Nordic Seas (IESSNS) main priority is standardized surface trawling for mackerel at predetermined locations. Additionally, abundances of Norwegian spring-spawning herring and blue whiting will be recorded using acoustics, from surface to 500 m depth. Stratified random survey design is used to predetermine survey location. Location of the first transect and the first station, in each stratum, is randomized and all other transect/stations located at a set distance from the first transect/station.

There are eleven strata and effort varies between them, from 40 nmi to 80 nmi between stations (Figure 6.1). Effort is higher in stratum with greater abundance and higher expected variability in abundance. In general, each country surveys its exclusive economic zone (EEZ) and international waters are split between participants. In 2017, five vessels from four countries (Norway, Iceland, Faroe Islands, Greenland) contribute 127 vessel days to sample 296 surface stations and cover approximately 20 000 km of survey track. Survey coverage is similar to 2016 or roughly 3 million km2.

One stratum has been changed for 2017 compared to 2016; the Greenland stratum is split into two strata with different effort to reflect differences in mackerel abundance. The survey begins July 3rd and ends, the latest, August 5th. It is a challenge to coordinate the survey to minimize the possibility for double counting of fish. This specifically applies to the Icelandic strata, which circles the island. To account for this, Iceland will survey clockwise around the island starting in the northwestern region. Norway and Faroe Islands will start in the south and move northwards with east-west transects. The vessels will trade transects between stratum in a similar fashion as performed in 2016.

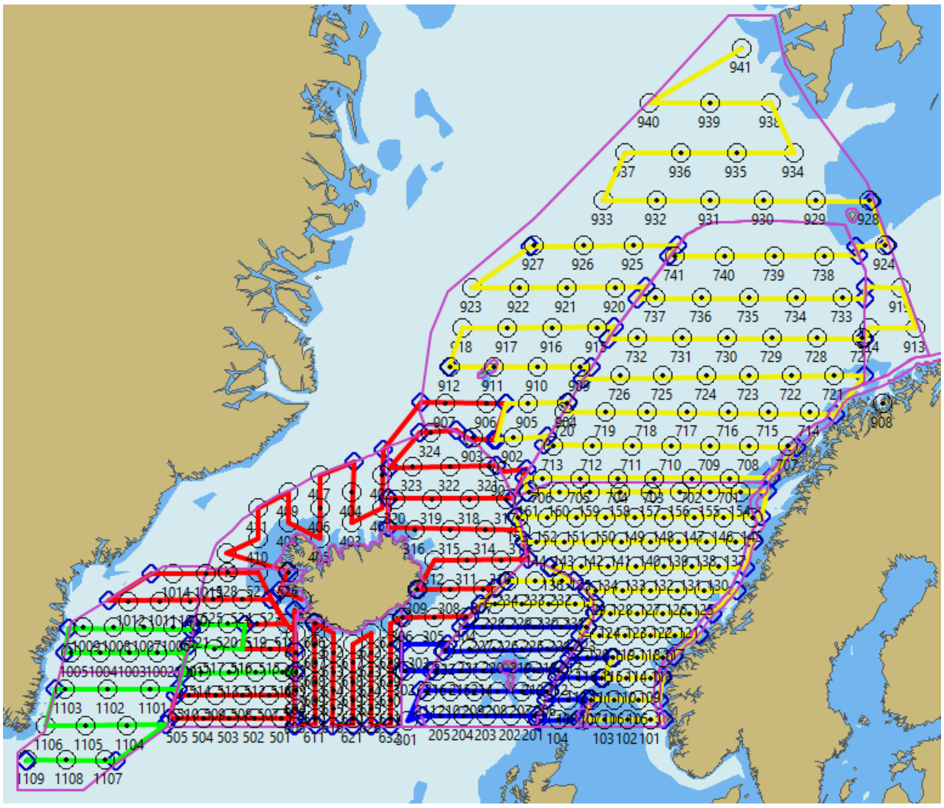

Figure A6.3. Preliminary surface stations (open black circles) and transects (yellow = Norway with 2 vessels, blue = Faroe Islands, red = Iceland, green = Greenland) for IESSNS from 3. July to 5. August 2017. Strata also delineated (magenta line).

HERAS

Norway, Denmark, Germany, Netherlands, Scotland and Ireland will participate in the 2017 HERAS and MSHAS surveys. Ships, preliminary dates and preliminary strata allocations are given in Table A6.3 below. Inshore extension is to be maintained at the 20m contour for shallow waters regions of the Baltic and south eastern North Sea and the 30m contour for all other areas where applicable. The Norwegian survey is bounded a set distance from shore (5 n.mi) due to operational reasons as the 30 m contour is not practical due to the steep coastal topography. The 200 m contour marks the lower depth limit of the survey at the shelf edge and in the northern boundary. The strata for 2016 are displayed in Figure A6.4 below.

The survey design has been standardised across participants and will follow best practice in terms of transect planning. The main body of the survey will utilise systematic parallel transect lines with randomised starting points and with transects running perpendicular to lines of bathymetry. Zig-zag transects will be used in instances where parallel lines are not practical due to operational reasons, such as bays and inlets, and will be stratified accordingly (Strata 2 and 61).

The survey effort, e.g. transect spacing will be maintained at similar level to 2016. Survey effort should also ensure adequate coverage of the North Sea sprat stock, which requires that the southern boundary of the survey area be kept at 52°N.

The final design of strata and allocation of transects will be confirmed over the coming months in discussion with participants. The survey design and the allocation of survey area and transects to vessels/nations must consider the specialist skills required to adequately cover the areas where stock splitting is carried out based on biological samples. In all strata to the west of 4°W there is a requirement to collect tissue samples for genetic analysis as well as photographs of herring and otoliths, and to carry out analysis of otolith shape and body morphometry to prepare for splitting the acoustic index into VIaN and VIaS stock components. This sampling has been carried out by Scotland and Ireland since 2010 and it was recommended in the February 2015 benchmark of the Malin Shelf herring stocks that these efforts be continued (ICES 2015).

To the East of 2°E and North of 56°N, in the areas covered by Denmark and Norway in previous years, there is a requirement to be able to split the survey abundance into North Sea Autumn spawning herring and Western Baltic spring spawning herring. Denmark does this based on otolith shape analysis and provides stock discrimination on the individual fish level, whereas Norway uses a vertebrae count method that provides information only at the strata level. A workshop to standardise the method to one that will provide stock information at the individual fish level is planned for November 2017 (WKSIDAC). Additional sampling on the 2017 survey has been requested for this workshop.

Collection of otoliths for WKSIDAC 2017

In addition to the collection of otoliths for shape analyses by MSS and IMR, the following is required.

1. Two samples (25 fish each) of herring otoliths from the vicinity of the German Bight i.e. east of 6 degrees E. The samples are to be from separate statistical rectangles and preferably at least 60 nautical miles apart.
2. One sample (25 fish) of herring otoliths from fish south of 54 degrees North
3. Two samples (25 fish each) of herring otoliths from fish in the central part of the North Sea i.e. 54 to 56.5 degrees N and 0 to 5 degrees East.
4. A set of 25 herring otoliths from 0 or 1 winter ring fish from any location.

In all cases the otoliths are **NOT** to be mounted i.e. stored dry. All standard fish and haul information to be collected.

Analysis and reporting

A post-cruise meeting will be held in Bergen 14 – 17th November 2016. The post-cruise meeting will allow the group to evaluate survey data, discuss issues arising from the surveys and produce the combined survey estimate. Data uploaded to the ICES acoustic database for the 2016 survey is not complete in all cases. This should be rectified in time for the 2017 post cruise meeting. Survey data for 2017 survey is to be uploaded to the ICES Acoustic database in the agreed format no later than **31 October 2016.**

Table A6.3. Time periods, areas and rectangles to be covered in the 2017 acoustic survey.

Vessel	Available days for survey	Period available	Strata to cover
Celtic Explorer (IRE)	Period includes Boarfish survey	6 June – 22 July	2, 3, 4, 5, 6
Scotia (SCO)	22	29 June – 20 July	1, 121, 101, 111, 91 (North of 58°30′N)
Commercial charter (SCO)	Up to 20	29 June – 18 July	1, 121, 101, 111, 91 (North of 58°30′N)
Johan Hjort (NOR)	18	1 July – 19 July	11, 141
Dana (DEN)	14	23 June – 5 July	21, 31, 41, 151
Tridens (NED)	17	3 July – 21 July	81, 91 (North of 58°30′N)
Solea (GER)	21	28 June – 18 July	51, 61, 71, 131

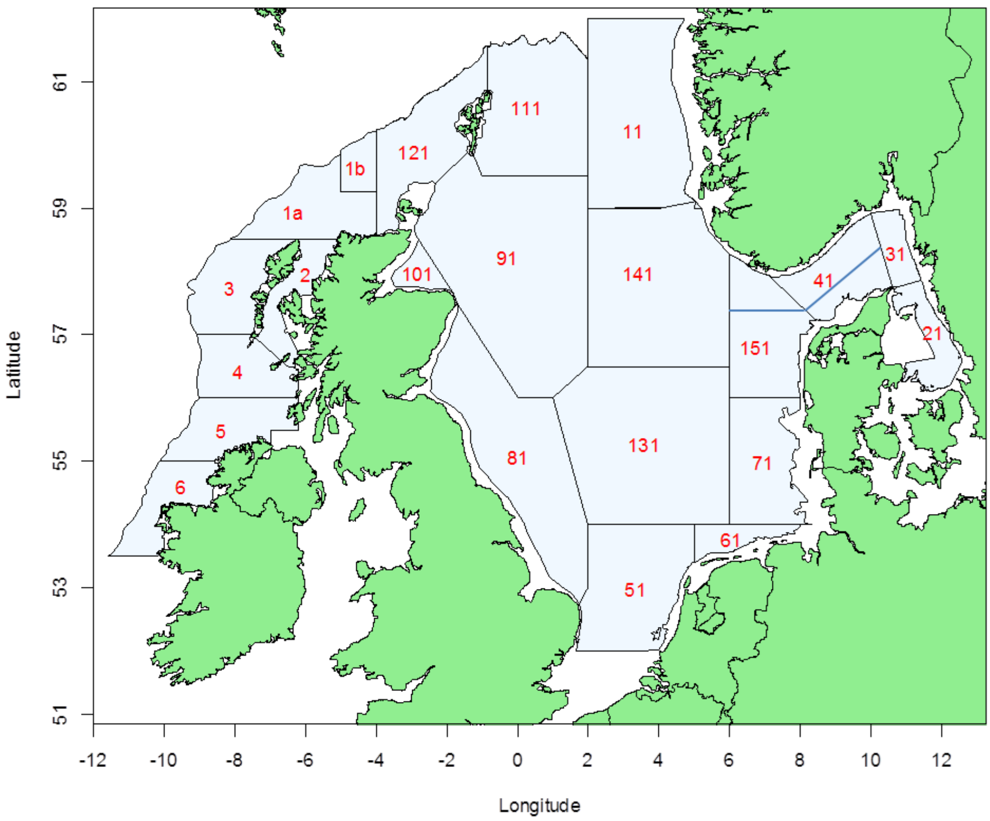

Figure A6.4. Strata for the HERAS 2017 survey.

WESPAS

The 2017 WESPAS (Western European Shelf Pelagic Acoustic Survey) will be carried out on board the RV *Celtic Explorer*. In 2017 the survey will begin in the south (6th June) and work progressively northwards over 42 days ending on the 21 July. The change in survey direction in 2017 has been ratified by WGIPS. Changing the survey rotation will provide closer temporal and spatial alignment with the PELGAS survey (IFREMER) in the south and the Scottish survey onboard the RV *Scotia* in the north ensuring improved containment overall. The survey will be broken into three 2-week legs for logistical purposes.

The scheduled work program will also include marine mammal surveys (visual and passive acoustic), seabird abundance and distribution and plankton sampling.

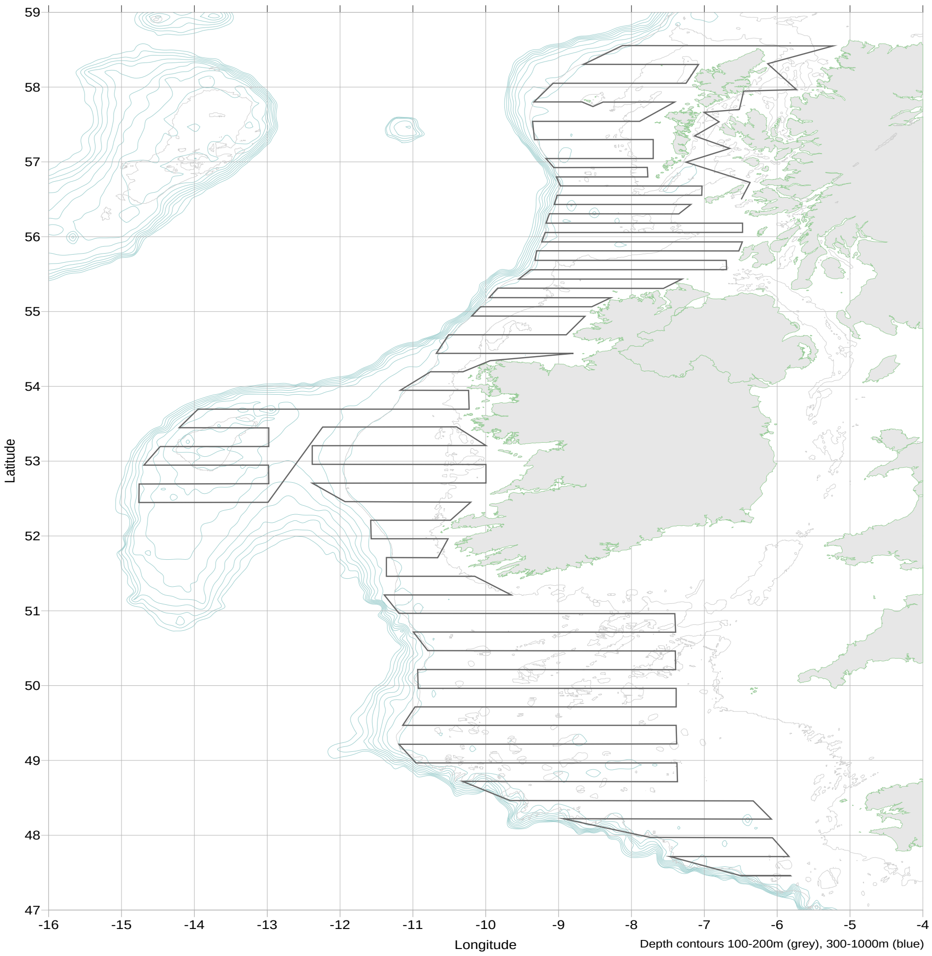

Figure A6.5. Proposed track plan for the WESPAS survey 2017.

CSHAS

The Celtic Sea acoustic survey 2017 will be carried out on board the RV *Celtic Explorer* from the 15 October to the 04th November (21 days). Survey design was modified in 2016 to ensure stock containment. Time continues to be allocated towards adaptive high intensity surveys of hyper aggregations of the remaining offshore component of the stock. Details of the change in survey design have been communicated to HAWG and presented to WGIPS for review.

Hydrographic, seabird and marine mammal surveys will be undertaken in continuation of established programs.

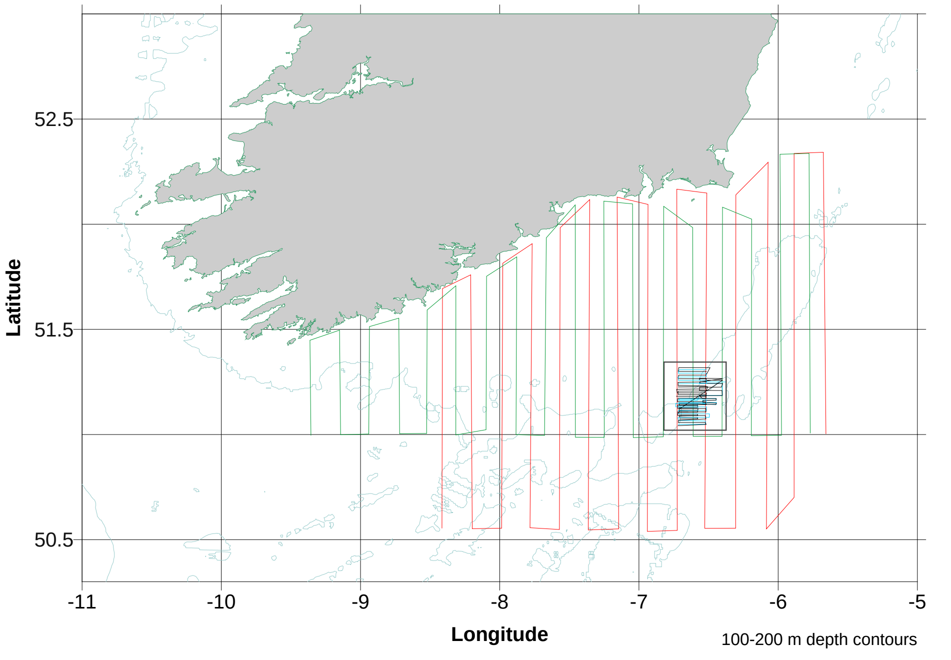

Figure A6.6. Survey effrot in 2016 showing replicate broadscale surveys and high intensity adaptive covereage. Proposed track plan for the CSHAS survey 2017 will follow this design.

<u>ISAS</u>

The 2017 Irish Sea acoustic survey (ISAS) will be carried out onboard the RV *Corystes* between August 29th and September 15th. Figure A6.7 shows the plan and acoustic tracks for cruise C03517. The survey design of systematic, parallel transects covers approximately 620 nm and will be divided into two parts, transects around the periphery of the Irish Sea is randomized within +/- 4 nm of a baseline position each year with spacing set between 8-10 nm. Transect spacing is reduced to 2 nm in strata around the Isle of Man to improve precision of estimates of adult herring biomass.

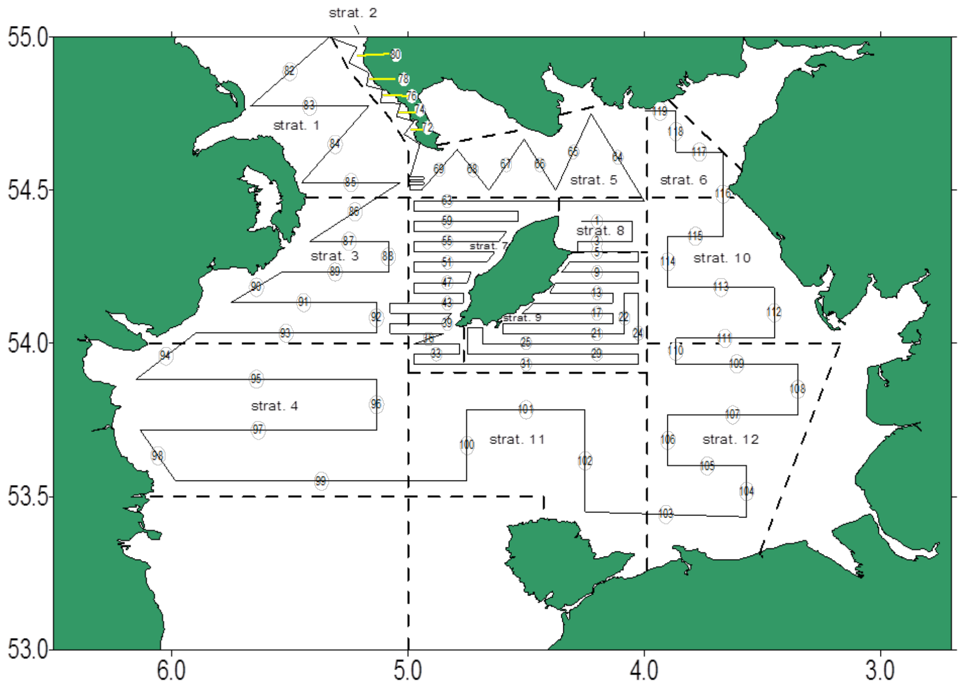

Figure A6.7. Map of Irish Sea and North Channel showing proposed coverage for the 2017 herring acoustic survey C03517.

GERAS

The GERAS acoustic survey 2017 will be carried out on board RV *Solea* from October 4 until October 24. The plan for cruise SB740 and acoustic transects to be followed follow the design adopted for the previous years (figure A6.8) but may be subject to change regarding recent difficulties in attaining all required permits from Swedish authorities and short-term notices of specific area closures in the Swedish survey area in preceding years.

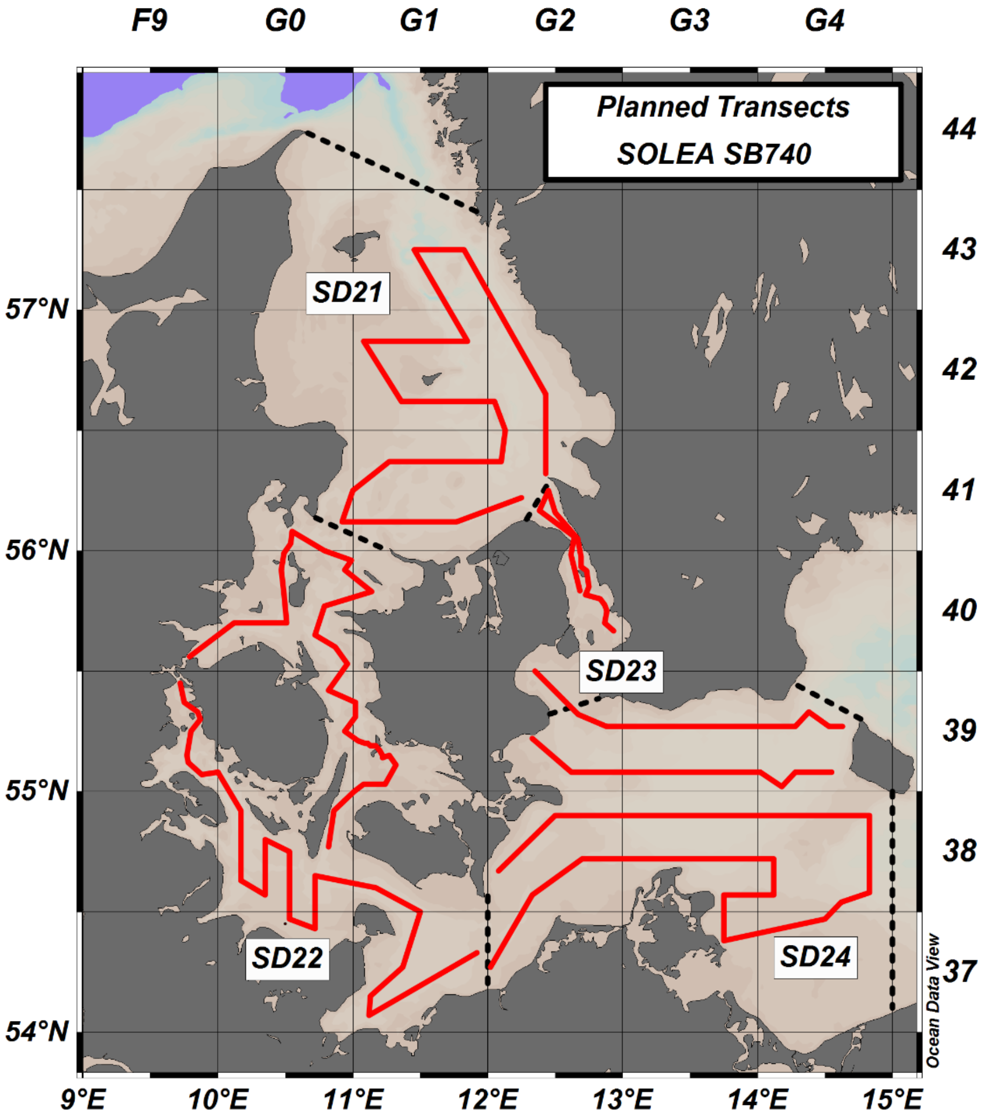

Figure A6.8. Map of the planned coverage in ICES Subdivisions (SD) 21-24 and acoustic transects for the German Acoustic Autumn Survey (GERAS) in 2017.

PELTIC

At the time of writing it was not confirmed whether a PELTIC survey will be conducted in 2017 given that project POSEIDON has completed. The plan however is to conduct a slightly longer, 22 day survey in early October covering the SW of the UK. The survey protocol will be the same as in previous years: a series of 10 nmi spaced transects will be run during daylight in conjunction with surface oceanographic measurements and marine mammal and bird observations. Pelagic hauls will be made to ground-truth the acoustic marks and collect biological information on the dominant pelagic fish species in the area: sprat, sardine, mackerel and anchovy. At night a regular grid of Zooplankton and CTD stations will be sampled. Where possible, regular communications with the CSAS survey will be maintained to coordinate coverage in the Celtic Sea. The extra time will be used to conduct more pelagic hauls and conduct a higher resolution survey grid in the coastal waters of Lyme Bay.

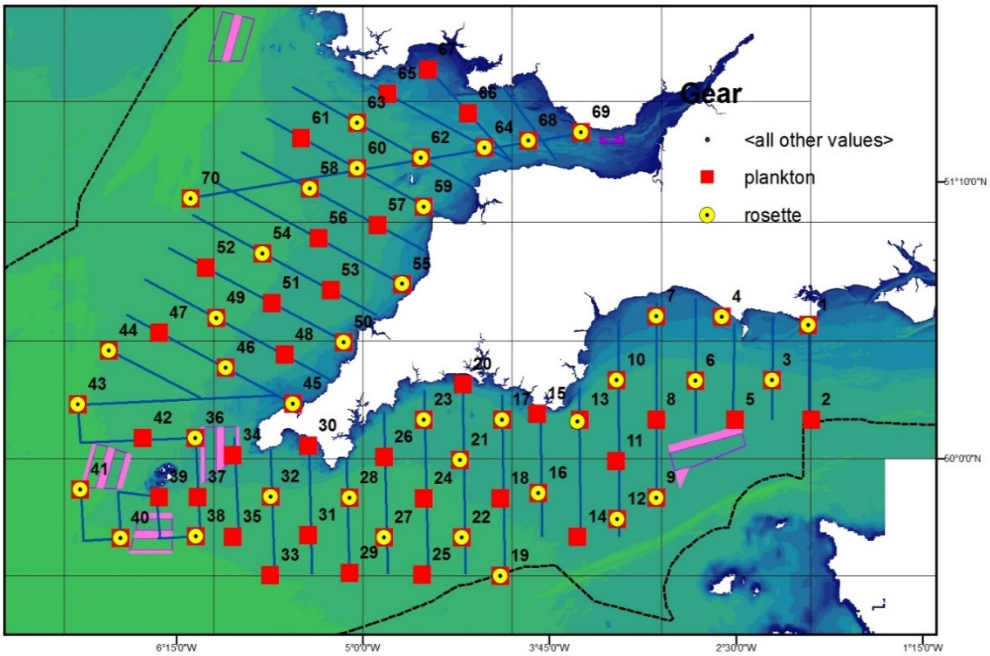

Figure A6.9. Figure Map of the acoustic transects (blue) and plankton (red) and hydrographic (yellow) stations of PELTIC 2016. Isles of Scilly transects (west) will not be covered.

Annex 7: Ecosystem Index Overview Table

	IBWSS					IESNS					HERAS						IESSNS			Western Baltic	CSHAS	WESPAS	Irish Sea	Peltic
Participating countries																								
✓																								
Data type																								
fish																								
Organism collection											✓					✓				✓				
Stomach sampling						✓					✓						✓							✓
Additional biological data (of non-target species)	✓		✓	✓		✓			✓		✓	✓		✓		✓	✓			✓	✓	✓	✓	✓
Disease/parasite registration											✓				✓									
Genetic information																								
Lipid content											(✓)													
Omnidirectional sonar observations of pelagic fish	✓																✓							
Tagging																								
Bioactive material																								
Scientific multibeam echosounder for 3D fish school shapes/schools observations in surface 'dead zone'																	✓							
Multifrequency echosounder data for species identification, abundance and biomass estimation (number of frequencies)	6		4	2		6					4	4	2		3/5	2	5			2	4	4	2	4

Physical/chemical oceanography																								
Continuous underway measurements	✓		✓	✓		✓			✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Station measurements	✓		✓	✓		✓			✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Water movement																	✓							
Nutrients											✓											(✓)		✓
Biological oceanography																								
Microbiological sampling																						(✓)		
Phytoplankton sampling									✓		✓			✓	✓									✓
Zooplankton samples			✓			✓			✓		✓			✓	✓		✓					✓		✓
Multifrequency echosounder data for zooplankton identification & abundance estimation (number of high frequencies >=38 kHz)	4		1	1		4					2	3	1		2/3	1	3			1	3	1	1	3
	IBWSS					IESNS					HERAS						IESSNS			Western Baltic	CSHAS	WESPAS	Irish Sea	Peltic
Participating countries																								
Charismatic megafauna																								
Visual observations			✓	(✓)							(✓)	✓				(✓)	✓				✓	✓	✓	✓
Towed hydrophones																						✓	✓	
Seabird observations																								
Species counts			✓									✓									✓	✓		✓
Abundance survey (ESAS)			✓									✓									✓	✓		✓
Habitat description																								
Camera observations			✓									✓					✓				✓	✓		
Sidescan sonar																								
Multibeam echsounder			✓									✓									✓	✓		

Physical ground samples																	✓							
Pollution																								
Litter			✓	✓					✓		✓	✓		✓	✓	✓				✓	✓	✓		✓
Pollution in water column											(✓)													
Pollution in sediments											(✓)													
Pollution in organisms											(✓)													
Environmental conditions																								
Weather condition	✓		✓	✓		✓			✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Sea state	✓		✓	✓		✓					✓	✓	✓	✓✓	✓	✓	✓			✓	✓	✓	✓	✓

Annex 8: Feedback on StoX & ICES db issues identified

HERAS Post cruise meeting, Bergen 14-17 November 2016

The HERAS survey group met at IMR in Bergen to review herring surveys carried out in 2016. A review document was compiled over the course of the meeting and is based on the experiences of the group during the calculation of global stock abundance. This document includes questions that require clarification and recommendations arising during this process.

Process steps specific to this document are as follows;

1. Formatting of national survey data using the ICES acoustic DB template

2. Upload of data to the ICES DB

3. Download of subsequent 'StoX xml' file from ICES DB

4. NASC Splitting within StoX;

5. Use of StoX xml (Biotic & Acoustic) files for the calculation of biomass and abundance within StoX

ICES Database feedback

1. Formatting data using the ICES template

Standardised upload template

The group agreed that the biotic and acoustic .csv file formats for uploading to the DB should be standardised and fixed in terms of the number of data columns. Having a fixed number of input fields will allow for the development of scripts and automation and reduce the number of errors associated with a variable template. As the optional data fields will likely become available over the course of several submissions then having these fields available will be of benefit.

Fish age classification

The group would like to have an additional field within the upload template to record species specific age classification. A similar field exists for age type (Otilith/Scale). For aged species fields should have the option of **Winter rings** or **Years**

Species ID

The list of Aphia Codes used to identify species within the database needs to be broadened to encompass more fish and invertebrate species encountered during such pelagic surveys. (For example: Euphausiidae, KRZ, 110671)

Specific points highlighted by users:

DataAcquisitionCode: Need to add EK80 as a field.

"SampleSvThreshhold" -> misspelling…only on "h".

DataProcessingSoftwareName please add Ev2Akubio (Denmark)

Mandatory fields where data currently is not available the group agrees a common input value of **999** should be applied. The group should work towards populating these fields with valid data for future submissions.

Fish maturity labelling

A requirement exists within the group to report fish with either an immature or mature label. This is defined from the already provided data maturity data (M6) and the three categories (IMM, MAT, ABN) would be exported in the biotic xml file.

The group recommends that the long term solution requires that both maturity (M6) and category by individual is reported in the biotic xml. To achieve this the group will require an additional field in the biotic.csv to accompany the existing M6 field allowing the reporting of IMM, MAT or ABN by individual.

Biology input file

BiologyLengthCode = halfcm while Individual fish lengths in mm. This is confusing and needs to be more clearly defined in the input description template.

CatchSpeciesCategory

Adjusting of existing to allow for the input of species categories for the same species occurring as for example 2 size classes within the biotic input csv; large and small as individual Catch categories. This will also need to be included as an output in the biotic xml for StoX.

2. Upload of data to the ICES DB

The upload portal and procedure was regarded as easy and straightforward.

Feedback through the validation report was considered good with line number identification. However, the group recommends that the line numbers in the validation report relate to those in the input file to allow for accurate problem identification.

Deleting data from the DB was considered both secure and straight forward.

3. Download of subsequent 'StoX xml' file from ICES DB

The acoustic and biotic xml formats are currently displayed in two viewer formats leading to the latter being difficult to view. If possible the group would like to the two files with the same layout properties (Pretty print xml viewing in Notepad ++).

StoX feedback

4. NASC Splitting within StoX

The NASC splitting element is a pre-requisite step in the calculation of global biomass. This procedure uses a function within StoX to produce output xml files for use in the stock abundance calculation process.

The need within the group to have this function available has been acknowledged by both users and developers.

Currently the definition of trawl distance is a requirement in this process as a measure of trawling effort. It is a requirement that this metric is recorded in the biotic StoX xml in nmi (nautical miles).

The group recognises the importance of this component of StoX and so recommends that development occurs alongside the main acoustic abundance calculation component.

5. Use of StoX xml files for the calculation of biomass

Precision estimate

The precision estimate output currently generated from StoX needs to include all strata where effort was occurred regardless of whether target species were observed or not. It is understood that the current calculation only applies to strata where target species were observed and so is not a true reflection on total survey effort.

For reporting purposes it would be very beneficial to have a full description of the methods employed within StoX to calculate precision and the limitations of these methods.

Output of common tasks

As part of the review process carried out by WKSUREP, reporting Dec 2016. The group would like to discuss the possibilities of including a Mapping element for routine tasks such as trawl positions, species distribution (acoustic) etc. A process has begun to develop scripting within R for common output and quality control using StoX as the common platform. This process will be continued and reviewed at future meetings.

Annex 9: StoX-recalculation of IESSNS swept area method

Working Document (WD) for WGIPS 2017 and WKWIDE 2017

Estimating Northeast Atlantic mackerel abundance from IESSNS with StoX

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Introduction

The International Ecosystem Summer Survey in the Nordic Seas (IESSNS) has been conducted annually since 2007 with participating vessels from Norway (2007), Faroe Islands (2009), Iceland (2009) and Greenland (2014). The main objective of the IESSNS has been to obtain abundance estimates of mackerel based on standardized pelagic trawl hauls in the surface (swept-area approach) (Nøttestad et al. 2016a). Currently, abundance estimates divided by area covered in the age range 6-11 are used in the annual ICES stock assessment of NEA mackerel (ICES 2016).

From 2015 onwards the design (position of trawl stations and acoustic transects) of IESSNS has been based on a statistical approach with large strata and uniform distribution of stations and transects within strata. However, before 2015 the survey was conducted according to an ad-hoc approach where the survey area was divided into rectangles of 1º lat × 2º lon, and one trawl haul (in a few cases more than one trawl haul) was conducted within each square. This square-based approach makes it difficult to estimate uncertainty and may lead to biased estimates since it is not based on statistical principles. To try to overcome this problem Nøttestad et al. (2016a) used a post-stratification approach where the squares mentioned above were grouped into larger strata, following logical rules. The typical size of these so-called pseudostrata was 2º lat × 4º lon. The estimated abundance by age in Nøttestad et al. (2016) were fairly precise with a coefficient of variation (CV) of around 20 % for ages 3-12. These new estimates were not compared with the estimates from the square-based approach that are currently used in the ICES stock assessment.

We recommend in this working document to start using the software StoX to calculate the swept-area abundance estimates of mackerel from IESSNS. StoX is currently used in different pelagic acoustic surveys, both nationally (e.g. the Norwegian spring-spawning herring survey along the Norwegian coast in February) and internationally (e.g. the International blue whiting spawning survey IBWSS). StoX can also be used to calculate estimates from swept-area surveys and the method is quite similar to the one used in Nøttestad et al. (2016a). StoX has been used to recalculate historic estimates from the joint Norwegian-Russian bottom trawl survey in the Barents Sea (1994-2016) and these new estimates are very similar to the old estimates and the differences are not systematic (Mehl et al. 2016). The estimates from Mehl et al. (2016) will be presented for use in different assessments in the upcoming ICES Arctic Fisheries Working Group (AFWG). Two advantages with StoX compared with methods and software used earlier are (1) transparency; it is easy for users to access details of the calculations and (2) uncertainty is estimated (bootstrap approach). Moreover, since StoX is an open system this makes it less likely that only one or a few persons are able do the calculations during post-cruise meetings. Unfortunately, this has often been the case, increasing the probability for possible errors in the calculations. Applying StoX will improve the quality control system and reduce the probability for unfortunate errors in the calculations used in the assessment. When transitioning to a new tool it is advantageous to re-calculate historic estimates, both as a quality check and to use a consistent method to obtain the estimates over time. In this working document we therefore present such re-calculations with StoX for the years currently used in the mackerel assessment (2007 and 2010-2016). As mentioned above, the design in 2015-2016 is based on a statistical approach which corresponds to the assumptions in StoX, while earlier years are based on the square-based approach. Since it has already been conducted work by Nøttestad et al. (2016a) to “force” the data prior to 2015 into a statistical design, the re-calculations with StoX are based on this work regarding how strata are defined. The most central settings and results from StoX are presented here, but more details can easily be accessed by exploring the folders containing the StoX projects, preferably by opening the projects in StoX.

Material and methods

Data from 2007 and 2010-2016 were extracted from the PGNAPES database as xml files (biotic) using the PGNapesClient version 1.0 (last updated September 9, 2016). Cruise reports were used to ensure that all selected vessels and time periods (termed cruises) were from IESSNS with one exception based on discussion with the Faroese: in 2011 a different Faroese cruise (1152) is now used in the IESSNS data. Moreover, the Norwegian biotic xml files extracted from the PGNAPES data base were later replaced by corresponding files created internally at IMR since this was regarded to reduce the probability of data errors due to conversions etc.

All trawl stations were investigated to ensure that they belonged to stations used for abundance estimation in the IESSNS survey and not stations used for inter-calibration between vessels or other special investigations (the participants from each country were contacted to confirm that deletion of their stations was correct). The stations used for abundance estimation in StoX are shown in Appendix 1.

StoX version 2.2 was used to calculate the estimates. A description of StoX together with documentation and software can be found here: http://www.imr.no/forskning/prosjekter/StoX/nb-no. The xml files extracted from the PGNAPES database were imported directly into StoX (function: ReadBioticXML) and all filtering of stations were done in StoX (function: FilterBiotic). Estimated horizontal trawl openings, i.e. the sampling width of the trawl are shown in Table 1. These figures are taken from the cruise reports (Nøttestad et al. 2007, 2010-2016b). The vertical sampling height of the trawl of around 35 m is assumed to cover all the mackerel distributed in the vertical dimension.

The strata used in StoX are shown for each year in Figure 1-8. As mentioned in the Introduction, the definition of strata for the years 2007 and 2010-2014 were based on the strata in Nøttestad et al. (2016a). However, some small adjustments were made in StoX: The strata limits toward the Norwegian coast are now based on the baseline (defined by the Norwegian authorities as line segments termed "grunnlinje" in Norwegian) to be consistent with the strata used in 2015 and 2016. In addition, a few strata were adjusted and merged mainly due to differences in selected stations. However, these differences with the strata in Nøttestad et al. (2016) are considered to have a very minor effect on the survey area and in practice the strata systems can be viewed as nearly identical. The strata used in 2015 and 2016 were based on the "a priori" survey design, but some adjustments were done on the fringes on the dynamic strata (if parts of a stratum were not covered then the originally designed strata should be reduced).

Results

Total estimates of abundance, mean weight and mean length of mackerel from StoX are shown in Table 2-6 and 8-10. Table 7 shows a total estimate for 2013 when excluding data south of 60º N in the North Sea area (which is a candidate for the survey time series since the survey coverage in 2013 was extended more south compared to the other years). StoX estimates of abundance, mean weight and mean length of mackerel by stratum are shown in Appendix 2 and estimated area by stratum are shown in Appendix 3. Uncertainty estimates based on bootstrapping in StoX are shown in Appendix 4 and 5. In Figure 9 and 10 total stock biomass and stock numbers are compared with estimates from Nøttestad et al. (2016a) and with estimates from the cruise reports. The point estimates are quite similar but the confidence intervals from StoX are smaller than the confidence intervals from Nøttestad et al. (2016a). Internal consistency of the StoX estimates, i.e. the strength of the relationship between the log abundance estimates for the same cohorts at consecutive ages are shown in Figure 11. The internal consistencies are quite strong except between age 5 and 6.

In StoX a so-called superindividual table is produced where abundance is linked to population parameters like age, length, weight, sex, maturity etc. (exact name: 1_FillMissingData_SuperIndividuals.txt). This table can be used to split the total abundance estimate by any combination of population parameters (as well as strata groups). However, the table is too large to be presented in a working document.

Discussion

The results from StoX are quite similar to the results from Nøttestad et al. (2016) with no apparent systematic differences for point estimates. There are many factors that can explain differences in results between the two works. First, the selections of trawl stations are not identical. For example, in Nøttestad et al. (2016a) some inter-calibration stations etc. were erroneously included (approximately 40 stations) and some stations were erroneously removed (approximately 50 stations). Moreover, in 2011 the data from Faroes Islands are not the same in the two works (as explained in the Methods section). In addition, both some strata and some assumed horizontal trawl opening in StoX are slightly different from Nøttestad et al. (2016a). The results from the cruise reports are also quite similar to the results from StoX, however these are based on a different method and potential differences in basic data have not been explored yet. Comparing the results from StoX and Nøttestad et al. (2016a), the confidence intervals around the StoX estimates are lower. Without going into too much technical details this can be explained by existing theory: bootstrapping is generally expected to give slightly too low variance when there are few primary sampling units within each stratum. In addition, the method used in Nøttestad et al. (2016a) is expected to give a slight overestimate of variance. To conclude the discussion on comparison between methods we regard it as quite reassuring that the results are similar (at least on an aggregated level).

The purpose of this working document has been to document the StoX runs. Thus, discussion about assumptions in the swept-area method, spatial coverage etc are left out here. These topics are dealt with in another working document (Olafsdottir et al. 2017) for the WKWIDE 2017.

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Tables

Table 1. IESSNS. Assumed horizontal sampling width of the trawl by cruise and year.

Year	Country	Vessel	Cruise number	Opening (m)
2007	Norway	Eros	2007831	60
2007	Norway	Libas	2007830	60
2010	Faroe Islands	Finnur Fríði	1051	50
2010	Iceland	Árni Friðrikson	A10-2010	23
2010	Norway	Brennholm	2010807	60
2010	Norway	Libas	2010810	60
2011	Faroe Islands	Finnur Fríði	1152	60
2011	Iceland	Árni Friðrikson	A8-2011	45
2011	Norway	Libas	2011826	70
2012	Faroe Islands	Christian í Grótinum	1252	70
2012	Iceland	Árni Friðrikson	A8-2012	62
2012	Norway	Brennholm	2012825	65
2012	Norway	G.O. Sars	2012118	65
2013	Faroe Islands	Finnur Fríði	1352	59.2
2013	Iceland	Árni Friðrikson	A7-2013	66
2013	Norway	Eros	2013826	65.1
2013	Norway	Libas	2013827	68.4
2014	Faroe Islands	Finnur Fríði	1452	63
2014	Iceland	Árni Friðrikson	A6-2014	65
2014	Norway	Brennholm	2014812	65
2014	Norway	Vendla	2014813	66
2015	Faroe Islands	Christian í Grótinum	1552	60.7
2015	Iceland	Árni Friðrikson	A7-2015	63
2015	Norway	Brennholm	2015832	66
2015	Norway	Eros	2015831	67
2016	Faroe Islands	Tróndur í Gøtu	1652	63
2016	Greenland	Finnur Fríði	CH-2016-01	65.3
2016	Iceland	Árni Friðrikson	A8-2016	65.2
2016	Norway	M. Ytterstad	2016828	65
2016	Norway	Vendla	2016829	66

Table 2. IESSNS 2007. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

	age																		
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Number	Biomass	Mean W
																	(1E3)	(1E3kg)	(g)
22-23	49113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49113	4919.2	100.16
23-24	139467	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139467	15385.6	110.32
24-25	379225	28988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	408213	49768.5	121.92
25-26	464172	73722	-	-	-	-	-	-	-	-	-	-	-	-	-	-	537894	74642.3	138.77
26-27	276967	205482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	482450	76210.7	157.97
27-28	161933	284149	88233	-	-	-	-	-	-	-	-	-	-	-	-	-	534314	98326.9	184.02
28-29	60953	324287	17753	-	-	-	-	-	-	-	-	-	-	-	-	-	402993	85232.6	211.50
29-30	-	443961	11549	57944	-	-	-	-	-	-	-	-	-	-	-	-	513454	122176.2	237.95
30-31	-	513185	94773	22964	-	-	-	-	-	-	-	-	-	-	-	-	630921	164412.0	260.59
31-32	-	204246	175774	2492	2287	-	-	-	-	-	-	-	-	-	-	-	384799	112122.6	291.38
32-33	-	93688	122320	8839	58525	1956	-	-	-	-	-	-	-	-	-	-	285328	91708.3	321.41
33-34	-	14587	198309	11616	15445	-	-	-	-	-	-	-	-	-	-	-	239956	85551.4	356.53
34-35	-	4234	149674	15546	77346	1259	-	-	-	-	-	-	-	-	-	-	248060	98802.5	398.30
35-36	-	-	64508	28156	212362	15835	3254	121	-	-	-	-	-	-	-	-	324236	140357.8	432.89
36-37	-	-	10326	22492	218494	15566	5005	-	-	-	-	-	-	-	-	-	271883	128882.2	474.03
37-38	-	-	3901	32930	288210	6567	6829	1311	2194	806	-	-	-	-	-	-	342748	173267.9	505.53
38-39	-	-	-	1605	115458	40258	10149	5317	939	-	-	-	-	-	-	-	173726	93100.8	535.91
39-40	-	-	-	1230	39095	40816	11791	10244	7473	164	538	179	-	-	-	-	111529	64243.9	576.03
40-41	-	-	-	-	12115	23591	4878	11668	4796	2658	252	1158	-	96	-	-	61212	37232.9	608.26
41-42	-	-	-	-	1017	1967	2629	6060	1310	1491	582	-	387	-	-	45	15487	9992.0	645.17
42-43	-	-	-	-	-	-	-	407	7113	2497	2281	1333	301	-	97	-	14028	9903.1	705.93
43-44	-	-	-	-	-	-	-	-	-	1418	6528	300	5525	229	86	-	14085	10707.2	760.17
44-45	-	-	-	-	-	-	-	-	-	-	-	-	113	-	1343	-	1456	1147.9	788.42
45-46	-	-	-	-	-	-	-	-	-	-	-	-	-	229	100	-	329	265.5	805.90
46-47	-	-	-	-	-	-	161	-	-	-	-	-	-	-	-	-	161	144.3	896.00
47-48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-	100	88.3	880.00
TSN(1000)	1531829	2190530	937118	205816	1040356	147816	44695	35127	23826	9034	10180	2969	6325	554	1727	45	6187946	-	-
TSB(1000 kg)	211684.0	507628.1	303005.7	73717.3	492919.1	78403.8	24192.4	20835.1	14206.1	5943.6	7716.8	1956.6	4591.1	409.0	1350.6	33.3	-	1748592.6	-
Mean length (cm)	24.99	28.70	31.83	32.86	36.03	37.95	38.09	39.47	39.98	40.90	42.38	41.14	42.85	43.31	44.07	41.00	-	-	-
Mean weight (g)	138.19	231.74	323.34	358.17	473.80	530.41	541.28	593.13	596.25	657.95	758.02	658.95	725.86	738.34	782.04	746.00	-	-	282.58

Table 3. IESSNS 2010. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	110	110	10.4	94.00
24-25	331	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	331	36.5	110.33
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26852	26852	3884.7	144.67
26-27	-	211297	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211297	36541.0	172.94
27-28	-	945030	-	570	-	-	-	-	-	-	-	-	-	-	-	-	945599	169450.8	179.20
28-29	-	845678	110471	-	-	-	-	-	-	-	-	-	-	-	-	-	956150	190204.4	198.93
29-30	6157	894083	76016	1497	-	-	-	-	-	-	-	-	-	-	-	-	977753	212805.0	217.65
30-31	3090	504483	242844	57387	-	-	-	-	-	-	-	-	-	-	-	-	807804	197519.7	244.51
31-32	845	92758	449580	156330	14882	2208	-	-	-	-	-	-	-	-	-	-	716603	198602.4	277.14
32-33	-	17083	317434	690648	214562	17610	-	-	-	-	-	-	-	-	-	-	1257336	388973.5	309.36
33-34	-	63744	258538	1165711	389671	108082	391	73	-	-	-	-	-	-	-	-	1986210	668087.7	336.36
34-35	-	200	120526	1205508	820397	148024	31565	361	4606	-	-	-	-	-	-	-	2331187	856223.5	367.29
35-36	-	207	31979	557294	845703	347821	124153	5414	2170	-	-	-	-	-	-	-	1914741	764099.5	399.06
36-37	-	-	4450	149823	545264	428880	66712	119230	3384	1541	-	-	-	-	-	-	1319285	567815.1	430.40
37-38	-	64	28	44622	152921	293175	142393	57914	4490	12781	1646	-	-	-	-	-	710034	340947.2	480.18
38-39	-	-	5012	3179	27106	135036	128910	70913	49206	2130	649	213	3237	3871	25	-	429488	222924.1	519.05
39-40	-	-	126	223	40497	65010	82593	58645	36925	3860	5820	-	-	-	-	-	293699	170393.1	580.16
40-41	-	471	-	-	1362	24954	60898	62838	61260	24296	1761	10273	59	289	-	-	248462	152476.7	613.68
41-42	-	-	-	2700	1515	14601	44887	17155	22449	10059	2929	8310	-	-	-	-	124605	83534.9	670.40
42-43	-	-	-	155	5101	5700	8672	17154	10742	8276	10957	5898	1296	282	-	-	74231	52912.2	712.80
43-44	-	-	-	-	166	-	148	3554	2317	1899	985	86	5454	700	-	-	15308	11610.5	758.45
44-45	-	-	-	-	-	-	614	-	557	960	-	626	55	114	-	-	2926	2329.0	795.90
45-46	-	-	-	-	-	-	-	-	-	-	-	1105	318	-	-	-	1423	1152.4	809.89
46-47	-	-	-	-	-	-	-	-	-	-	-	-	-	400	-	-	400	194.2	485.02
TSN(1000)	10423	3575099	1617005	4035646	3059146	1591100	691936	413253	198106	65803	24747	26511	10419	5656	25	26963	15351836	-	-
TSB(1000 kg)	2581.7	743798.7	467904.4	1418069.0	1193724.7	698146.4	353916.0	215168.6	113263.2	38454.4	16131.3	17844.9	6874.7	2944.0	11.8	3895.1	-	5292728.7	-
Mean length (cm)	29.30	28.34	31.41	33.45	34.62	35.95	37.42	38.02	39.25	39.75	40.64	41.05	41.37	39.61	38.00	24.99	-	-	-
Mean weight (g)	247.70	208.05	289.36	351.39	390.22	438.78	511.49	520.67	571.73	584.38	651.85	673.12	659.85	520.49	463.00	144.46	-	-	344.76

Table 4. IESSNS 2011. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

age

LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
6-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1058	1058	37.3	35.28
18-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26516	26516	1370.1	51.67
19-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	115277	115277	6137.3	53.24
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77124	77124	4690.9	60.82
21-22	6521	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6521	527.1	80.83
22-23	7071	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7071	663.2	93.79
23-24	39251	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39251	4594.1	117.04
24-25	64870	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64870	7434.6	114.61
25-26	99177	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99177	12622.9	127.28
26-27	139358	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139358	21498.7	154.27
27-28	18019	123302	-	-	-	-	-	-	-	-	-	-	-	-	-	141321	25793.1	182.51
28-29	-	340518	-	-	-	-	-	-	-	-	-	-	-	-	-	340518	69304.6	203.53
29-30	-	164155	179920	8232	-	-	-	-	-	-	-	-	-	-	-	352307	82298.9	233.60
30-31	-	74373	475976	38052	-	-	-	-	-	-	-	-	-	-	-	588400	150736.2	256.18
31-32	-	43242	400313	109041	189539	-	-	-	-	-	-	-	-	-	-	742135	208220.9	280.57
32-33	-	44016	551096	272846	93994	-	-	-	-	-	-	-	-	-	-	961952	295760.8	307.46
33-34	3035	11662	200100	262196	297980	127801	24	-	-	-	-	-	-	-	-	902799	304704.6	337.51
34-35	-	49701	37647	331371	407743	175543	3357	27637	-	-	-	-	-	-	-	1033000	387389.2	375.01
35-36	-	-	20146	228075	494505	380348	73656	1115	-	91188	-	-	-	-	-	1289032	529937.4	411.11
36-37	-	-	12610	118412	548488	260041	187646	16099	13719	-	-	-	-	-	-	1157015	514721.1	444.87
37-38	-	-	11459	44877	153051	223120	191504	41764	4308	2138	-	-	-	-	-	672222	327703.1	487.49
38-39	-	-	-	9703	83987	114959	110757	59195	54034	51	666	-	-	-	-	433351	226491.8	522.65
39-40	-	-	-	15099	23492	33226	121377	55459	51144	13940	6837	1652	2582	1166	-	325973	185386.1	568.72
40-41	-	-	-	-	8451	23348	49753	42782	11328	18281	7283	2715	-	-	-	163940	98921.1	603.40
41-42	-	-	-	9359	448	304	10926	27323	20295	22066	-	1351	-	431	-	92503	58792.9	635.58
42-43	-	-	-	-	1538	1708	2543	12636	3700	8197	9017	4919	965	-	-	45224	31252.9	691.07
43-44	-	-	-	-	-	-	5476	-	-	8776	-	2092	6929	1247	-	24520	17631.9	719.07
44-45	-	-	-	-	-	-	-	2627	-	-	1423	853	111	-	-	5015	3739.8	745.76
45-46	-	-	-	-	-	-	3398	-	-	-	-	-	-	-	-	3398	2964.0	872.26
TSN(1000)	377302	850968	1889267	1447260	2303217	1340399	760416	286638	158528	164637	25226	13583	10588	2844	219975	9850848	-	-
TSB(1000 kg)	51732.2	198695.0	544064.7	529423.9	920388.4	585269.6	383741.7	152583.2	87056.9	83062.9	15413.0	8908.4	7011.6	1739.3	12235.7	-	3581326.7	-
Mean length (cm)	25.02	29.00	31.23	33.62	34.66	35.66	37.36	38.35	38.74	37.50	40.62	41.42	41.94	41.06	19.17	-	-	-
Mean weight (g)	137.11	233.49	287.98	365.81	399.61	436.64	504.65	532.32	549.16	504.52	611.00	655.87	662.24	611.52	55.62	-	-	363.56

Table 5. IESSNS 2012. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

	age																			
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Unknown	Number	Biomass	Mean W

																	(1E3)	(1E3kg)	(g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1924	1924	145.9	75.87
21-22	23474	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23474	1948.8	83.02
22-23	176241	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	176241	15959.6	90.56
23-24	272070	32863	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	304933	31509.4	103.33
24-25	325335	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	325542	37404.3	114.90
25-26	83459	201888	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	285346	38664.2	135.50
26-27	38752	700625	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	739378	114352.3	154.66
27-28	-	1534612	-	-	2119	-	-	-	-	-	-	-	-	-	-	-	-	1536731	263526.4	171.49
28-29	1988	1617871	11805	2119	-	-	-	-	-	-	-	-	-	-	-	-	-	1633783	311266.6	190.52
29-30	-	972537	40993	-	4087	-	-	-	-	-	-	-	-	-	-	-	-	1017617	214966.0	211.24
30-31	-	238876	240444	47113	-	-	-	-	-	-	-	-	-	-	-	-	-	526433	125845.8	239.05
31-32	-	76737	338715	94902	-	5717	-	-	-	-	-	-	-	-	-	-	-	516071	141574.0	274.33
32-33	-	26019	304221	370490	24520	3869	9200	2717	-	-	-	-	-	-	-	-	-	741036	227565.3	307.09
33-34	-	2909	186482	732669	253587	78818	19663	751	-	-	-	-	-	-	-	-	-	1274880	429943.5	337.24
34-35	-	14453	81825	554586	608194	406414	128865	11339	12162	-	-	-	-	-	-	-	-	1817839	660347.6	363.26
35-36	-	1122	63553	389995	659528	804503	455739	73998	19109	432	-	-	-	-	-	-	-	2467979	967232.4	391.91
36-37	-	-	10232	156425	427084	856019	436509	138556	34059	3939	-	-	-	-	-	-	-	2062824	870456.6	421.97
37-38	-	-	2114	22208	141760	520600	387858	268712	33499	12839	18221	-	-	-	-	-	-	1407810	637539.1	452.86
38-39	-	-	1283	9647	26035	123637	204596	118031	84309	27103	24270	42	-	-	-	-	-	618952	299474.4	483.84
39-40	-	-	1547	2102	16141	44208	94725	46950	80615	33731	12982	3504	341	-	-	-	-	336847	176337.2	523.49
40-41	-	-	33	984	955	1671	28139	46620	22870	34465	10868	2948	3051	21	-	-	-	152626	86145.7	564.42
41-42	-	-	-	21	315	4230	11826	24349	6822	18838	11184	11262	-	631	1196	-	-	90674	54200.3	597.75
42-43	-	-	-	-	40	1161	1173	6710	4543	13475	2746	12805	42	-	-	-	-	42696	25962.3	608.08
43-44	-	-	-	-	-	-	5649	1026	1501	2658	876	3911	445	-	-	86	-	16151	10383.3	642.87
44-45	-	-	-	-	-	-	-	603	-	1801	1541	736	-	-	31	-	-	4712	3333.8	707.47
45-46	-	-	-	-	-	-	-	-	-	-	1655	-	-	-	-	-	-	1655	1223.0	739.00
TSN(1000)	921318	5420720	1283247	2383260	2164365	2850847	1783942	740361	299490	149282	84344	35209	3880	652	1227	86	1924	18124153	-	-
TSB(1000 kg)	99022.0	1008954.7	370812.7	836367.1	844510.3	1179972.7	774561.4	345160.1	141815.5	80944.8	41370.8	20500.3	2036.2	350.6	730.2	52.6	145.9	-	5747307.9	-
Mean length (cm)	23.43	27.67	31.70	33.52	34.83	35.66	36.27	37.21	37.88	39.44	39.02	41.36	40.28	40.97	41.08	43.00	20.00	-	-	-
Mean weight (g)	107.48	186.13	288.96	350.93	390.19	413.90	434.19	466.21	473.52	542.23	490.50	582.25	524.85	537.58	595.31	615.00	75.87	-	-	317.11

Table 6. IESSNS 2013. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

	age																		
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Unknown	Number	Biomass	Mean W
																	(1E3)	(1E3kg)	(g)
5-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	773	773	-	-
6-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	216	216	-	-
18-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	861	861	42.6	49.50

19-20	8666	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8666	530.6	61.22
20-21	8672	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8672	571.1	65.86
21-22	12667	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12667	979.2	77.30
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36140	36140	3219.9	89.10
23-24	27808	53990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81798	8687.5	106.21
24-25	16865	203668	-	-	-	-	-	-	-	-	-	-	-	-	-	-	220532	26775.6	121.41
25-26	-	559816	6121	-	-	-	-	-	-	-	-	-	-	-	-	-	565937	76747.4	135.61
26-27	-	1276958	5614	-	-	-	-	-	-	-	-	-	-	-	-	-	1282572	198618.8	154.86
27-28	-	2100941	82405	-	-	-	-	-	-	-	-	-	-	-	-	-	2183347	372301.7	170.52
28-29	-	1609333	323347	36800	-	-	-	-	-	-	-	-	-	-	-	-	1969480	378705.1	192.29
29-30	-	1152907	1802014	-	-	-	7425	-	-	-	-	-	-	-	-	-	2962346	663947.9	224.13
30-31	-	419146	3532205	85641	151	5604	-	-	-	-	-	-	-	-	-	-	4042747	1011052.3	250.09
31-32	-	120362	2679613	297875	11599	12120	-	-	-	-	-	-	-	-	-	-	3121570	858765.1	275.11
32-33	-	29765	924319	619471	144905	23170	8512	3073	-	-	-	-	-	-	-	-	1753215	517553.7	295.20
33-34	-	9181	182763	594956	416567	183178	104	19768	-	-	-	-	-	-	-	-	1406517	457415.1	325.21
34-35	-	-	56108	424395	785836	487867	204017	27105	3089	-	43657	-	-	-	-	-	2032075	727949.1	358.23
35-36	-	-	40613	315834	997212	970201	340249	39088	7987	2133	7408	1665	-	-	-	-	2722390	1049568.5	385.53
36-37	-	-	9511	89822	498213	797547	813921	346870	60823	4596	3706	-	-	-	-	-	2625010	1091774.9	415.91
37-38	-	-	1403	31413	190946	579622	662951	325881	110664	9966	7364	3134	-	-	-	-	1923344	854096.4	444.07
38-39	-	-	1196	1558	42659	159378	347687	199711	63618	19755	34615	-	-	-	-	-	870177	413249.9	474.90
39-40	-	-	56	1499	8911	30216	143750	86893	79995	43923	2019	3240	-	-	5377	-	405879	205694.0	506.79
40-41	-	-	-	-	-	8931	41791	44028	48550	51363	23041	12943	58	-	1755	-	232459	125273.0	538.90
41-42	-	-	-	-	407	2331	12927	19977	17470	16623	17662	16916	1016	2176	-	-	107505	64305.5	598.16
42-43	-	-	-	-	1890	4530	1435	8773	6977	3515	7351	8500	1483	532	4866	-	49852	31211.8	626.09
43-44	-	-	-	-	-	1900	-	753	3162	1411	2519	2325	2449	3627	1498	-	19643	13794.9	702.28
44-45	-	-	-	-	-	-	223	-	-	3293	4339	-	-	-	1110	-	8965	6105.4	681.03
45-46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	465	-	465	357.6	769.52
47-48	-	-	-	-	-	-	-	-	-	-	-	-	93	-	-	-	93	76.3	819.00
TSN(1000)	74678	7536067	9647288	2499264	3099296	3266595	2584992	1121921	402334	156578	153681	48723	5100	6335	15070	37989	30655910	-	-
TSB(1000 kg)	7019.9	1377698.0	2475358.5	805041.3	1172322.6	1312963.0	1112939.4	499545.3	194582.9	81270.5	73521.3	27102.8	3334.7	4398.0	9010.0	3262.5	-	9159370.7	-
Mean length (cm)	22.07	27.35	30.29	32.92	34.66	35.51	36.46	37.03	38.01	39.35	37.72	40.41	42.35	42.23	41.04	21.47	-	-	-
Mean weight (g)	94.00	182.81	256.59	322.11	378.25	401.94	430.54	445.26	483.64	519.04	478.40	556.26	653.87	694.21	597.88	88.17	-	-	298.79

Table 7. IESSNS 2013. Total estimates of abundance, mean weight and mean length of mackerel, excluding stratum 12, 31, 32, 47 and 50.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL (Excluded: 12,31,32,47,50)

SpecCat: MAKRELL

age																			
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
5-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	773	773	-	-

6-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	216	216	-	-
19-20	1349	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1349	91.1	67.53
21-22	7173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7173	565.3	78.80
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31011	31011	2797.7	90.22
23-24	14469	51736	-	-	-	-	-	-	-	-	-	-	-	-	-	-	66205	7130.5	107.70
24-25	15090	174678	-	-	-	-	-	-	-	-	-	-	-	-	-	-	189768	23223.7	122.38
25-26	-	469459	-	-	-	-	-	-	-	-	-	-	-	-	-	-	469459	64353.4	137.08
26-27	-	1045801	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1045801	164879.5	157.66
27-28	-	1739482	44967	-	-	-	-	-	-	-	-	-	-	-	-	-	1784449	309037.0	173.18
28-29	-	1273109	250628	36800	-	-	-	-	-	-	-	-	-	-	-	-	1560537	307864.1	197.28
29-30	-	1057859	1639964	-	-	-	7425	-	-	-	-	-	-	-	-	-	2705248	612979.6	226.59
30-31	-	414514	3430060	70221	151	5604	-	-	-	-	-	-	-	-	-	-	3920550	984424.7	251.09
31-32	-	120246	2645363	289603	11599	12120	-	-	-	-	-	-	-	-	-	-	3078932	848556.4	275.60
32-33	-	29765	903775	609624	140822	23170	6919	3073	-	-	-	-	-	-	-	-	1717149	508100.6	295.90
33-34	-	9181	178958	591940	413644	173318	24	19768	-	-	-	-	-	-	-	-	1386833	451603.0	325.64
34-35	-	-	55253	418878	778989	483481	202925	24773	1908	-	43657	-	-	-	-	-	2009865	720824.4	358.64
35-36	-	-	40613	315261	986721	956617	325609	38227	7907	2133	7408	1665	-	-	-	-	2682162	1035612.3	386.11
36-37	-	-	9511	89822	497032	782043	806513	336047	55619	4596	3706	-	-	-	-	-	2584889	1076886.1	416.61
37-38	-	-	1403	31413	190946	575352	648909	313982	108899	8363	7364	3134	-	-	-	-	1889765	841209.9	445.14
38-39	-	-	1196	1558	42659	159378	344346	193896	50036	18740	33854	-	-	-	-	-	845664	402786.9	476.30
39-40	-	-	56	1499	8911	30216	143131	84755	78059	36772	83	201	-	-	5377	-	389060	197965.4	508.83
40-41	-	-	-	-	-	8931	40055	43912	47370	49839	20664	12943	58	-	1755	-	225528	121890.7	540.47
41-42	-	-	-	-	407	2331	12927	19977	17470	16033	15881	16153	1016	2176	-	-	104371	62603.2	599.81
42-43	-	-	-	-	1890	4530	1435	8773	6977	3515	7351	7766	1483	532	4866	-	49117	30810.0	627.28
43-44	-	-	-	-	-	1900	-	753	3162	1411	2519	2325	2449	3627	1498	-	19643	13794.9	702.28
44-45	-	-	-	-	-	-	223	-	-	3293	4339	-	-	-	1110	-	8965	6105.4	681.03
45-46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	465	-	465	357.6	769.52
47-48	-	-	-	-	-	-	-	-	-	-	-	-	93	-	-	-	93	76.3	819.00
TSN(1000)	38081	6385831	9201746	2456618	3073772	3218990	2540444	1087937	377406	144695	146826	44186	5100	6335	15070	31999	28775038	-	-
TSB(1000 kg)	4083.9	1194215.6	2385837.6	794455.0	1163878.1	1296682.1	1096370.1	486235.5	184273.9	75858.1	70182.3	24917.0	3334.7	4398.0	9010.0	2797.7	-	8796529.6	-
Mean length (cm)	22.88	27.41	30.35	32.95	34.67	35.52	36.47	37.04	38.05	39.39	37.63	40.47	42.35	42.23	41.04	21.48	-	-	-
Mean weight (g)	107.24	187.01	259.28	323.39	378.65	402.82	431.57	446.93	488.26	524.26	478.00	563.91	653.87	694.21	597.88	90.22	-	-	305.71

Table 8. IESSNS 2014. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

age

LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Unknown	Number	Biomass	Mean W
																	(1E3)	(1E3kg)	(g)

7-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	46	-	-
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	78	78	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	983	983	128.8	131.00
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2291	2291	358.0	156.27
27-28	12733	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12733	2602.4	204.39
28-29	-	45716	98491	-	-	-	-	-	-	-	-	-	-	-	-	-	144207	32599.1	226.06
29-30	-	147932	717393	70111	-	-	-	-	-	-	-	-	-	-	-	-	935436	231570.1	247.55
30-31	279	157799	2295532	124819	15508	-	-	-	-	-	-	-	-	-	-	-	2593937	691101.5	266.43
31-32	-	97012	2176617	769961	54007	652	4652	-	-	-	-	-	-	-	-	-	3102901	896935.4	289.06
32-33	-	52551	1063470	1471334	266115	24478	-	-	-	9696	-	-	-	-	-	-	2887644	908078.4	314.47
33-34	-	36872	428155	1311838	406559	140049	12974	419	6822	-	-	-	-	-	-	-	2343688	798802.1	340.83
34-35	-	23250	189339	575691	445401	278375	186193	66460	27327	-	-	-	-	-	-	-	1792036	669797.3	373.76
35-36	-	2501	44669	290735	499283	664572	425400	200210	28661	10212	-	-	-	-	-	-	2166243	885067.1	408.57
36-37	-	-	9586	179200	452513	814193	736935	353999	88480	11330	1824	-	-	-	-	-	2648060	1164085.0	439.60
37-38	-	486	9663	77044	382166	431676	807024	690419	228972	43319	28343	8431	20354	-	-	-	2727897	1284791.3	470.98
38-39	-	-	1250	11868	79550	188101	360521	403600	282429	54096	24750	-	693	-	-	-	1406857	707466.1	502.87
39-40	-	-	-	6725	57003	49324	165875	124227	93109	87043	5422	16130	2010	-	-	-	606867	324188.7	534.20
40-41	-	-	-	7130	675	25544	44093	37700	63945	120751	18526	18612	7817	-	96	-	344891	199186.6	577.54
41-42	-	-	-	-	663	7832	19618	23981	19094	24428	3951	5504	1519	-	239	-	106830	66064.3	618.41
42-43	-	-	-	-	-	3540	3535	9062	2745	14436	3392	17054	3901	97	-	-	57763	38143.9	660.35
43-44	-	-	-	-	-	2279	-	82	5670	2628	4054	5044	-	27	3649	-	23434	16672.5	711.47
44-45	-	-	-	-	-	-	1406	-	1756	1510	3641	-	-	-	-	-	8313	6740.6	810.87
45-46	-	-	-	-	-	-	-	-	-	297	1400	-	-	-	-	-	1697	1386.6	817.00
TSN(1000)	13011	564120	7034162	4896456	2659443	2630617	2768227	1910160	849010	379745	95304	70775	36295	124	3983	3398	23914831	-	-
TSB(1000 kg)	2684.5	154915.6	2020496.7	1645588.8	1068393.0	1138769.2	1259139.2	900033.6	417572.7	202636.2	50854.6	43195.5	18267.6	101.5	2630.4	486.8	-	8925765.9	-
Mean length (cm)	27.06	30.32	30.82	32.69	34.75	35.77	36.53	36.97	37.64	38.87	38.92	40.19	38.48	42.22	42.81	25.31	-	-	-
Mean weight (g)	206.32	274.61	287.24	336.08	401.74	432.89	454.85	471.18	491.84	533.61	533.60	610.32	503.32	818.53	660.38	148.68	-	-	373.23

Table 9. IESSNS 2015. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

	age														
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	2313	-	-	-	-	-	-	-	-	-	-	-	-	2313	170.3	73.63
21-22	43593	-	-	-	-	-	-	-	-	-	-	-	-	43593	3489.9	80.06
22-23	159675	-	-	-	-	-	-	-	-	-	-	-	-	159675	14467.6	90.61
23-24	251813	-	-	-	-	-	-	-	-	-	-	-	-	251813	25487.4	101.22
24-25	183337	-	-	-	-	-	-	-	-	-	-	-	-	183337	20786.2	113.38
25-26	137267	-	-	-	-	-	-	-	-	-	-	-	-	137267	18033.7	131.38

26-27	54793	30817	-	-	-	-	-	-	-	-	-	-	-	85610	12970.5	151.51
27-28	12008	2235	-	-	-	-	-	-	-	-	-	-	-	14243	2303.9	161.76
28-29	16807	12213	-	-	-	-	-	-	-	-	-	-	-	29021	5881.0	202.65
29-30	-	47155	28379	-	-	-	-	-	-	-	-	-	-	75534	17748.7	234.98
30-31	-	178148	153217	46784	-	-	-	-	-	-	-	-	-	378149	100711.3	266.33
31-32	-	258723	351392	707799	93801	-	-	-	-	-	-	-	-	1411714	409137.7	289.82
32-33	-	233483	594903	2034521	387104	22504	-	-	-	5304	-	-	-	3277819	1016011.6	309.97
33-34	-	42638	693281	1982542	1209922	89825	12425	-	316	-	-	-	-	4030949	1341092.9	332.70
34-35	-	2747	406066	1008477	1193016	204863	161097	5805	555	-	-	-	-	2982626	1069182.0	358.47
35-36	-	32939	195105	290435	815154	351744	145582	136393	3474	929	-	-	-	1971755	769133.5	390.08
36-37	-	-	70229	165509	432558	395520	287061	344761	143725	24935	-	-	-	1864298	800977.8	429.64
37-38	-	-	9634	100874	332926	399565	555288	325259	223805	57010	2035	3180	-	2009576	931890.2	463.72
38-39	-	-	36613	16289	240821	186720	259786	221316	210587	92922	26193	-	-	1291247	650210.7	503.55
39-40	-	-	1144	42712	63869	104553	111504	157413	109096	23985	12572	31111	2807	660768	357001.5	540.28
40-41	-	-	-	857	26737	29778	47558	49649	26145	47658	141	12954	2062	243541	136529.4	560.60
41-42	-	-	-	12523	1924	7583	26800	7181	7990	7327	19026	8465	708	99528	61023.4	613.13
42-43	-	-	-	-	1032	2909	21727	6126	492	7226	12014	5415	-	56941	36623.5	643.18
43-44	-	-	-	-	1645	-	-	-	1474	2960	-	-	2330	8408	5850.8	695.86
44-45	-	-	-	-	-	-	-	955	33	306	428	3594	-	5315	3378.2	635.54
45-46	-	-	-	-	1789	-	-	-	-	-	-	-	-	1789	1509.9	844.12
46-47	-	-	-	-	-	-	45	-	-	-	-	-	-	45	34.4	770.35
TSN(1000)	861607	841100	2539963	6409324	4802298	1795564	1628872	1254859	727691	270562	72410	64719	7907	21276875	-	-
TSB(1000 kg)	95709.4	238014.2	825398.6	2145306.1	1818775.6	778812.3	753861.0	589174.7	352706.9	134726.9	39671.3	35032.0	4449.2	-	7811638.3	-
Mean length (cm)	23.76	31.14	32.84	33.05	34.49	36.13	36.89	37.19	37.67	38.33	39.77	39.95	40.80	-	-	-
Mean weight (g)	111.08	282.98	324.96	334.72	378.73	433.74	462.81	469.51	484.69	497.95	547.87	541.29	562.67	-	-	367.14

Table 10. IESSNS 2016. Total estimates of abundance, mean weight and mean length of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: TOTAL

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	239	239	17.4	73.00
21-22	663	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	663	48.4	72.92
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1801	1801	144.7	80.34
23-24	1364	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1364	144.7	106.11
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156	156	20.0	128.00
25-26	-	1403	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1403	197.1	140.50
26-27	-	39728	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39728	6637.6	167.08
27-28	-	345056	-	5064	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350120	63698.7	181.93
28-29	-	999067	22035	-	3675	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1024776	205397.6	200.43

29-30	-	1641615	44556	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1686171	375237.6	222.54
30-31	-	1234996	102360	-	564	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1337920	327841.8	245.04
31-32	-	420209	110429	3546	20037	1519	-	-	-	-	-	-	-	-	-	-	-	-	-	555741	153388.9	276.01
32-33	-	123930	332026	171624	145855	28629	2336	-	-	-	-	-	-	-	-	-	-	-	-	804400	249854.8	310.61
33-34	-	102126	388013	691797	1062268	253122	31365	4866	952	-	2195	-	-	-	-	-	-	-	-	2536703	861026.8	339.43
34-35	-	26491	251032	1026206	1980974	1258556	98508	46067	11784	641	-	-	-	-	-	-	-	-	-	4700260	1709015.3	363.60
35-36	-	47677	101417	528245	1363806	1514662	328364	127341	21728	25116	3732	1691	-	-	-	-	-	-	-	4063778	1579460.3	388.67
36-37	-	-	21393	183404	476324	794173	443409	374387	182801	60113	39321	7443	-	-	-	-	-	-	-	2582766	1085648.3	420.34
37-38	-	-	240	21932	131520	298755	594261	535043	375044	234811	120754	9332	26396	-	7432	-	-	-	-	2355521	1079256.5	458.18
38-39	-	-	1204	3216	49312	192067	278742	375919	260487	205185	102160	70492	11739	3299	698	-	-	-	-	1554520	759494.0	488.57
39-40	-	-	-	-	9273	18526	103808	151888	191471	142314	109206	57642	8709	10244	1736	-	-	-	-	804817	420266.7	522.19
40-41	-	-	-	-	-	8138	11110	32631	43602	45897	51542	21116	15971	9488	3736	-	-	-	-	243233	134183.8	551.67
41-42	-	-	-	-	-	-	986	9050	18567	35168	16524	14016	2826	10434	273	-	-	-	-	107845	65762.8	609.79
42-43	-	-	-	-	-	-	137	1007	913	5111	3465	15935	7772	16406	1192	-	-	-	-	51937	32413.0	624.08
43-44	-	-	-	-	-	345	-	641	516	638	461	951	324	141	-	-	343	-	-	4361	2963.8	679.65
44-45	-	-	-	-	-	-	-	-	-	-	738	-	-	204	-	-	-	1488	-	2430	1919.2	789.77
45-46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	148	-	-	-	148	126.9	858.69
TSN(1000)	2027	4982298	1374705	2635033	5243607	4368491	1893026	1658839	1107866	754993	450100	198619	73737	50216	15069	148	343	1488	2196	24812801	-	-
TSB(1000 kg)	193.1	1152964.0	445332.9	949695.9	1947757.2	1723159.1	833716.5	760072.1	530955.7	368355.0	222365.2	103830.7	37685.0	28944.2	7476.1	126.9	214.3	1140.7	182.1	-	9114166.5	-
Mean length (cm)	22.64	29.45	32.67	34.01	34.41	35.15	36.54	37.09	37.63	38.01	38.25	38.99	38.82	40.65	38.58	45.15	43.00	44.22	22.03	-	-	-
Mean weight (g)	95.25	231.41	323.95	360.41	371.45	394.45	440.41	458.20	479.26	487.89	494.04	522.76	511.07	576.39	496.13	858.69	624.00	766.69	82.92	-	-	367.32

Figures

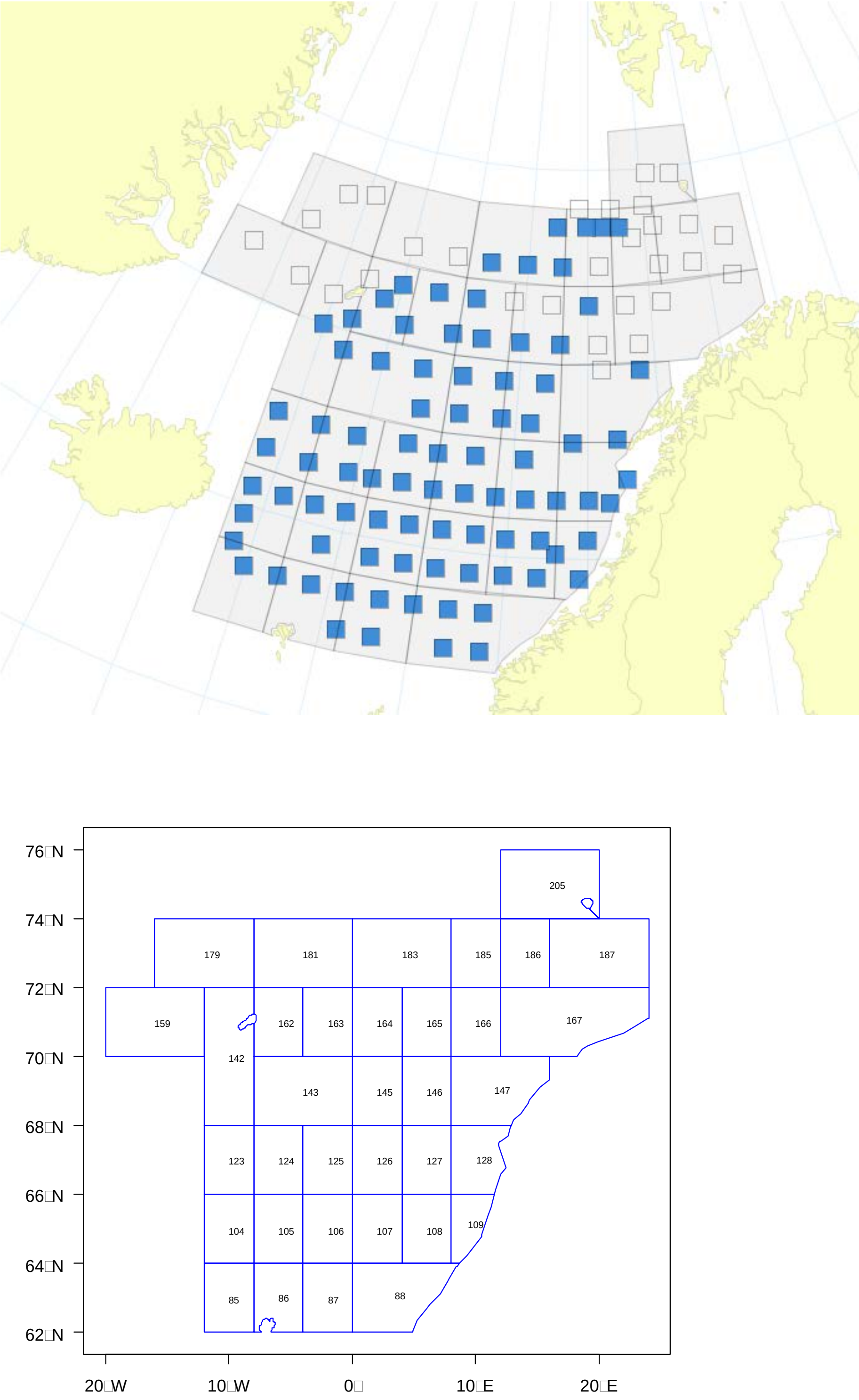


Figure 1. IESSNS 2007. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.

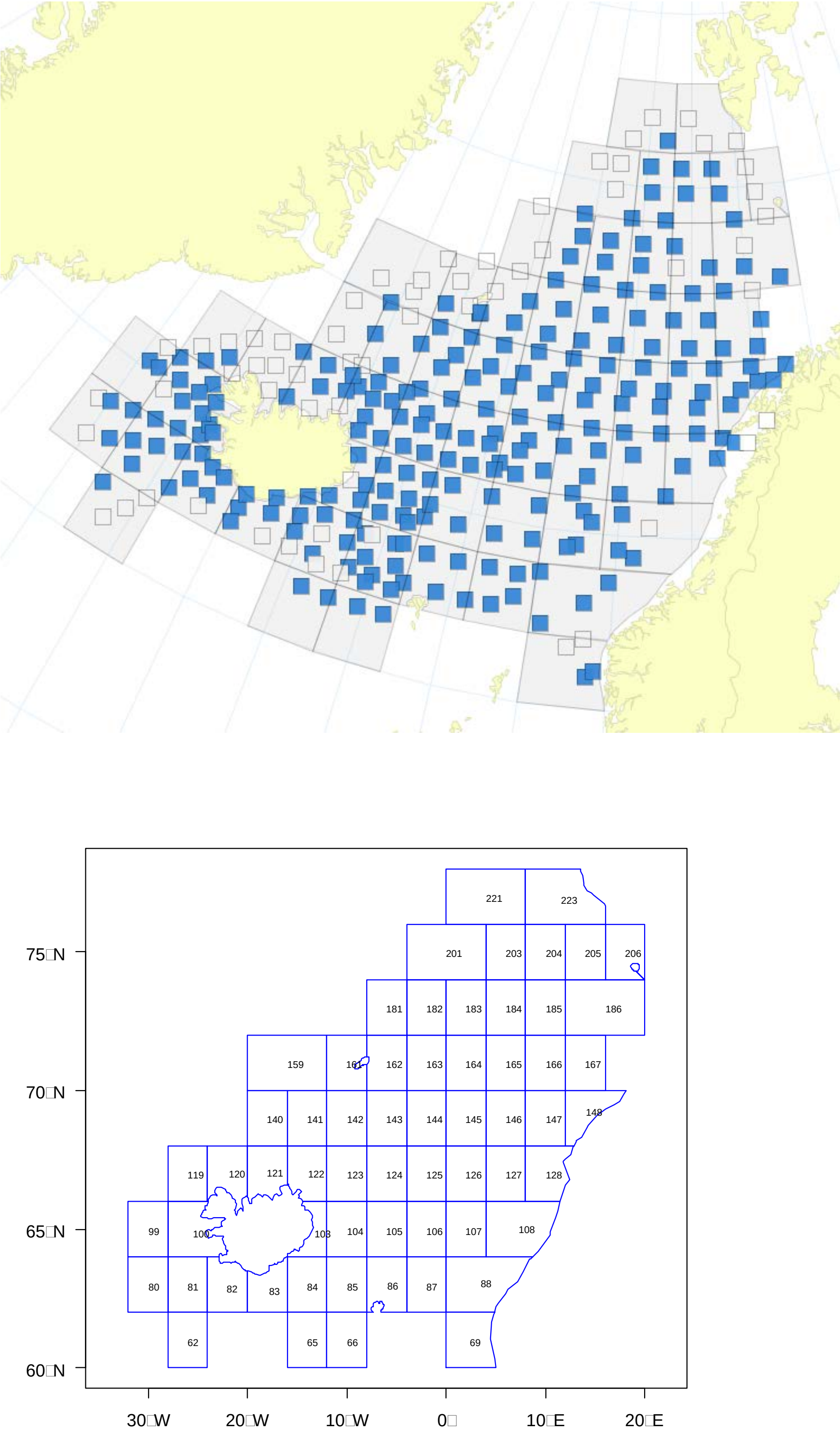
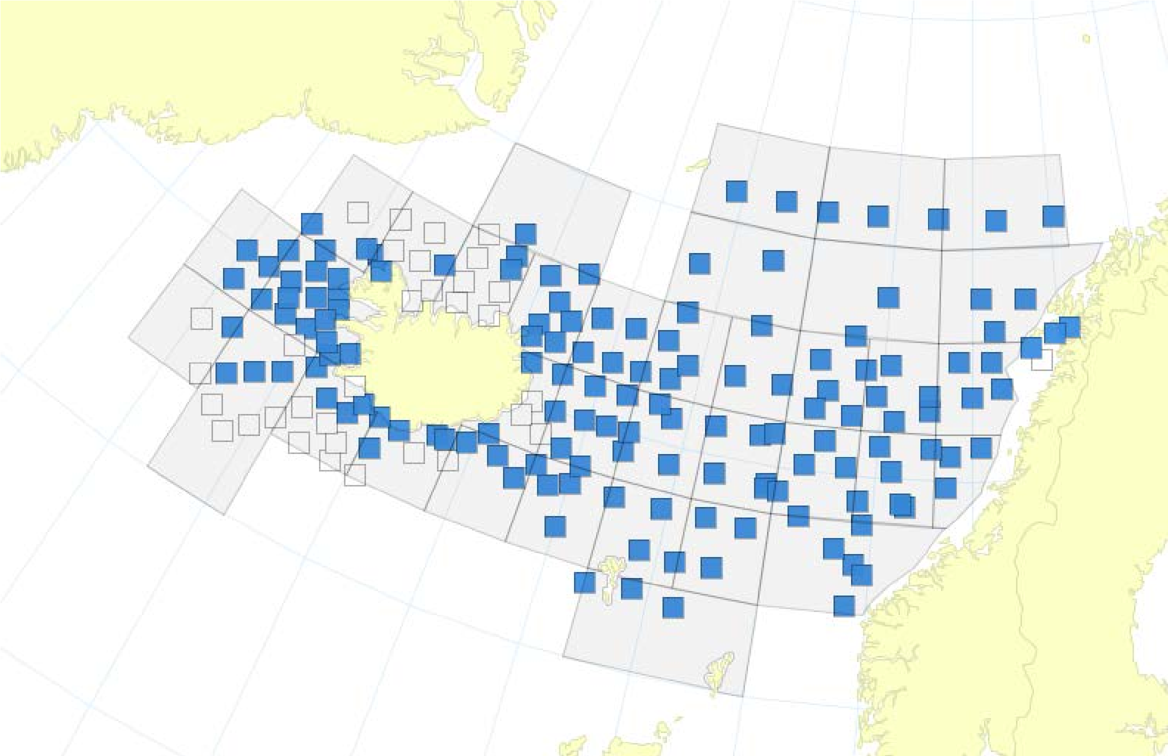


Figure 2. IESSNS 2010. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.



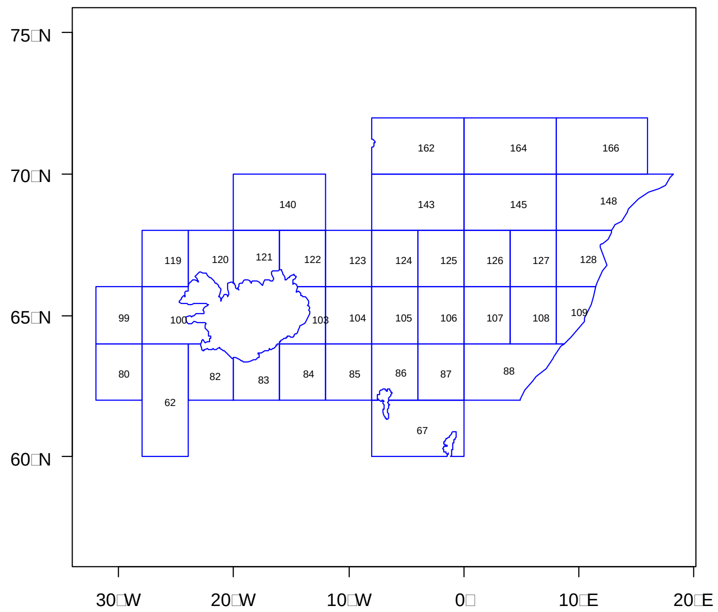


Figure 3. IESSNS 2011. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.

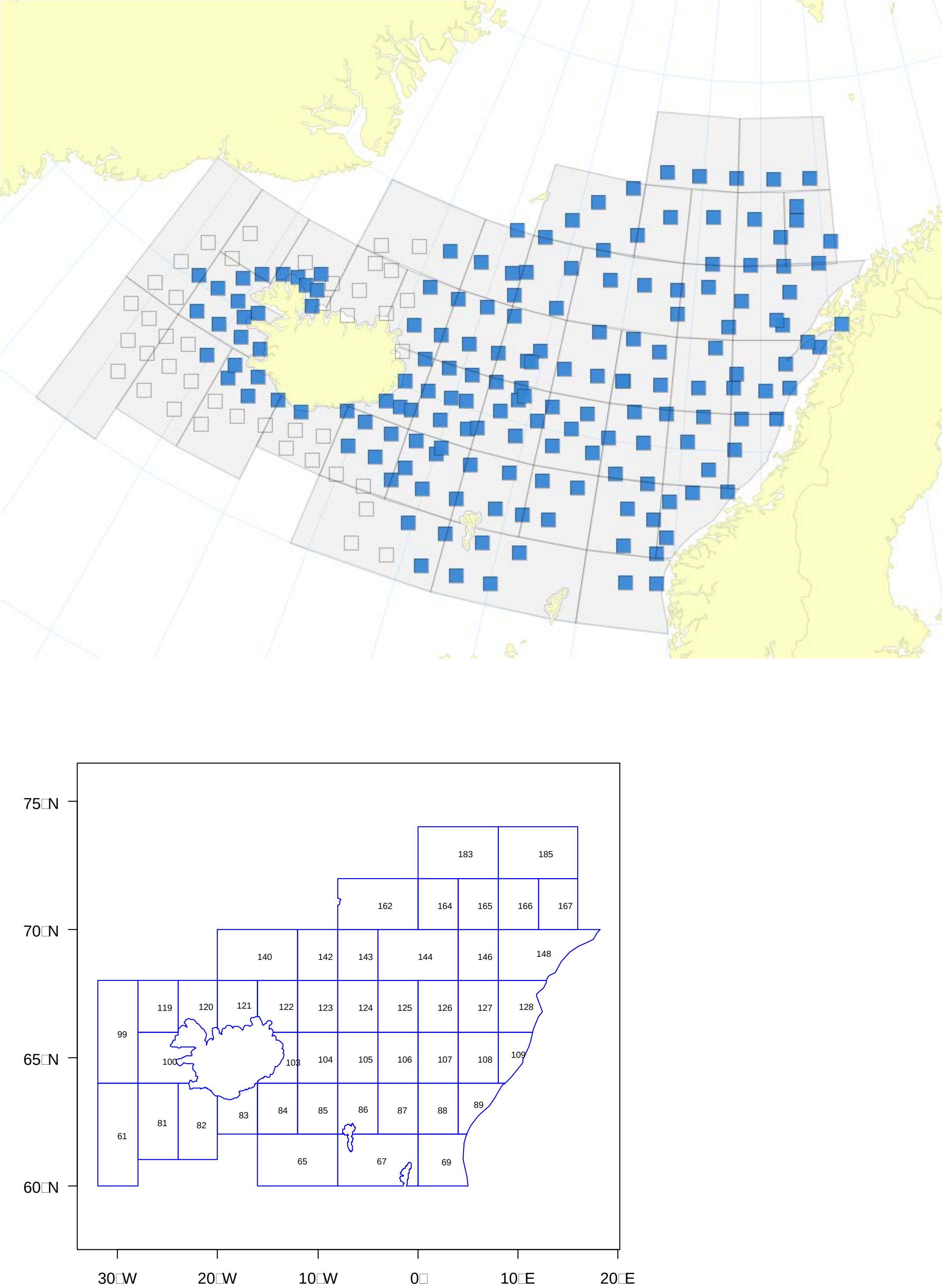
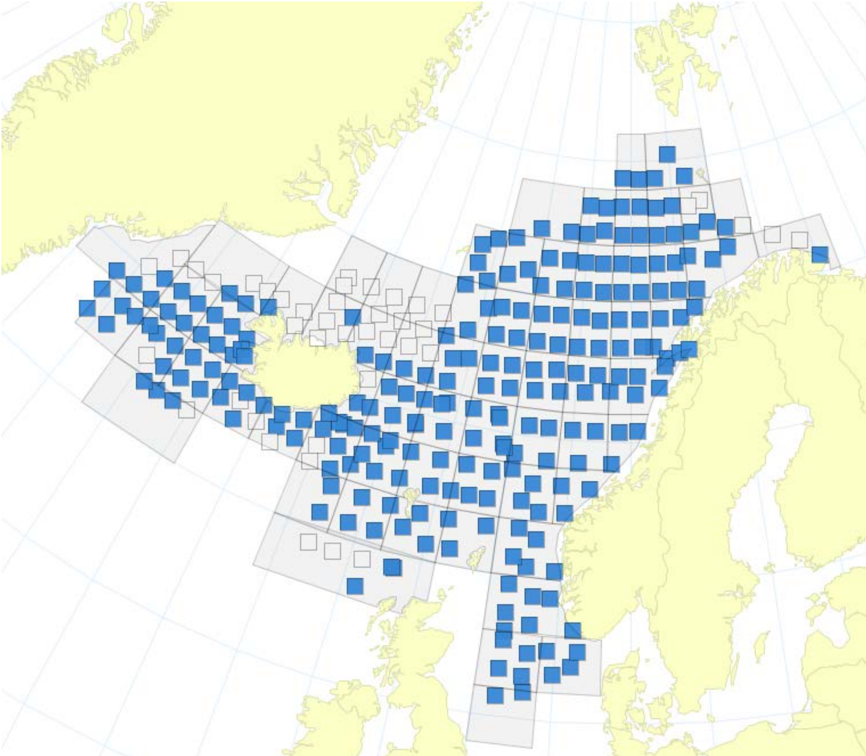


Figure 4. IESSNS 2012. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.



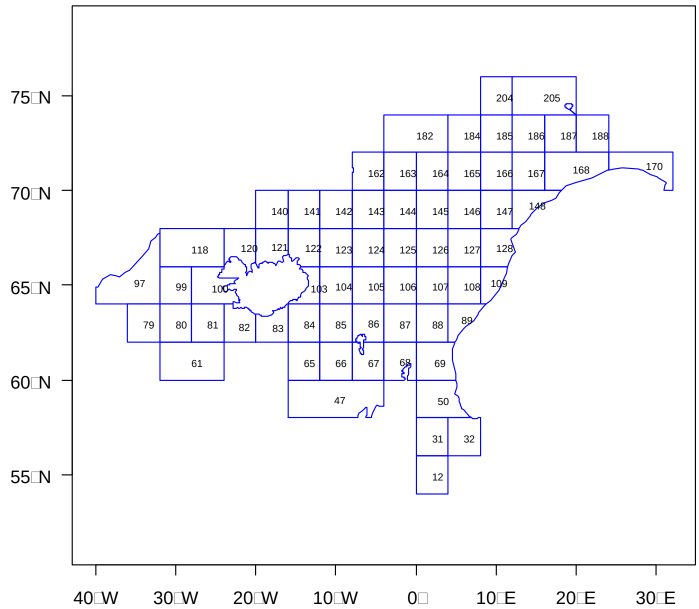
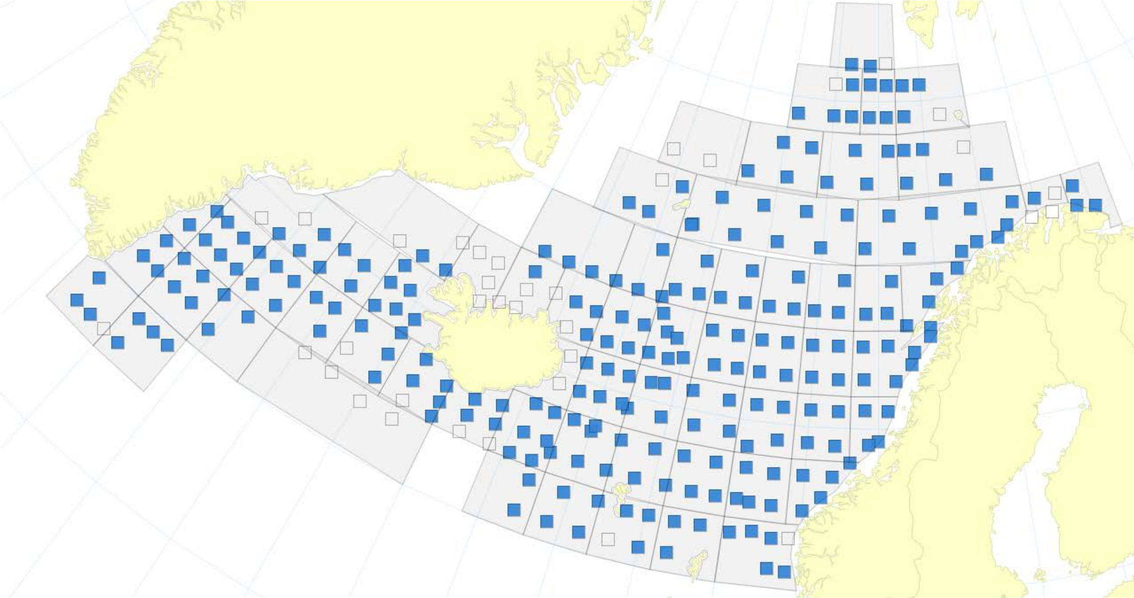


Figure 5. IESSNS 2013. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.



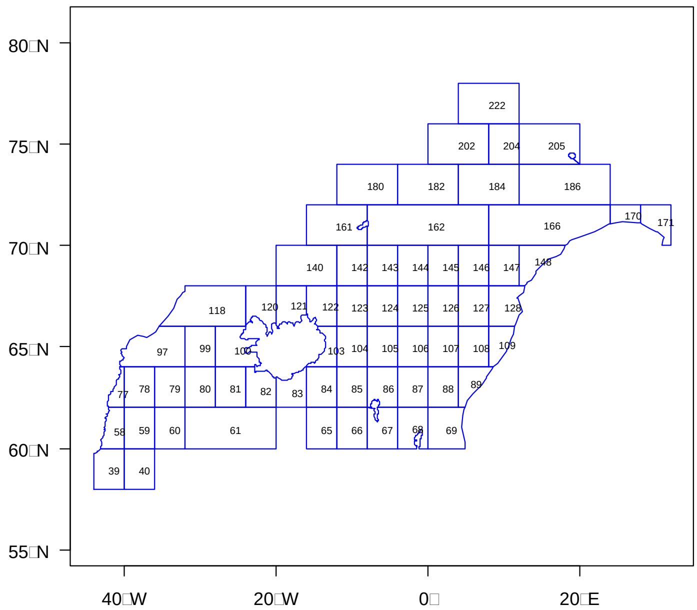


Figure 6. IESSNS 2014. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.

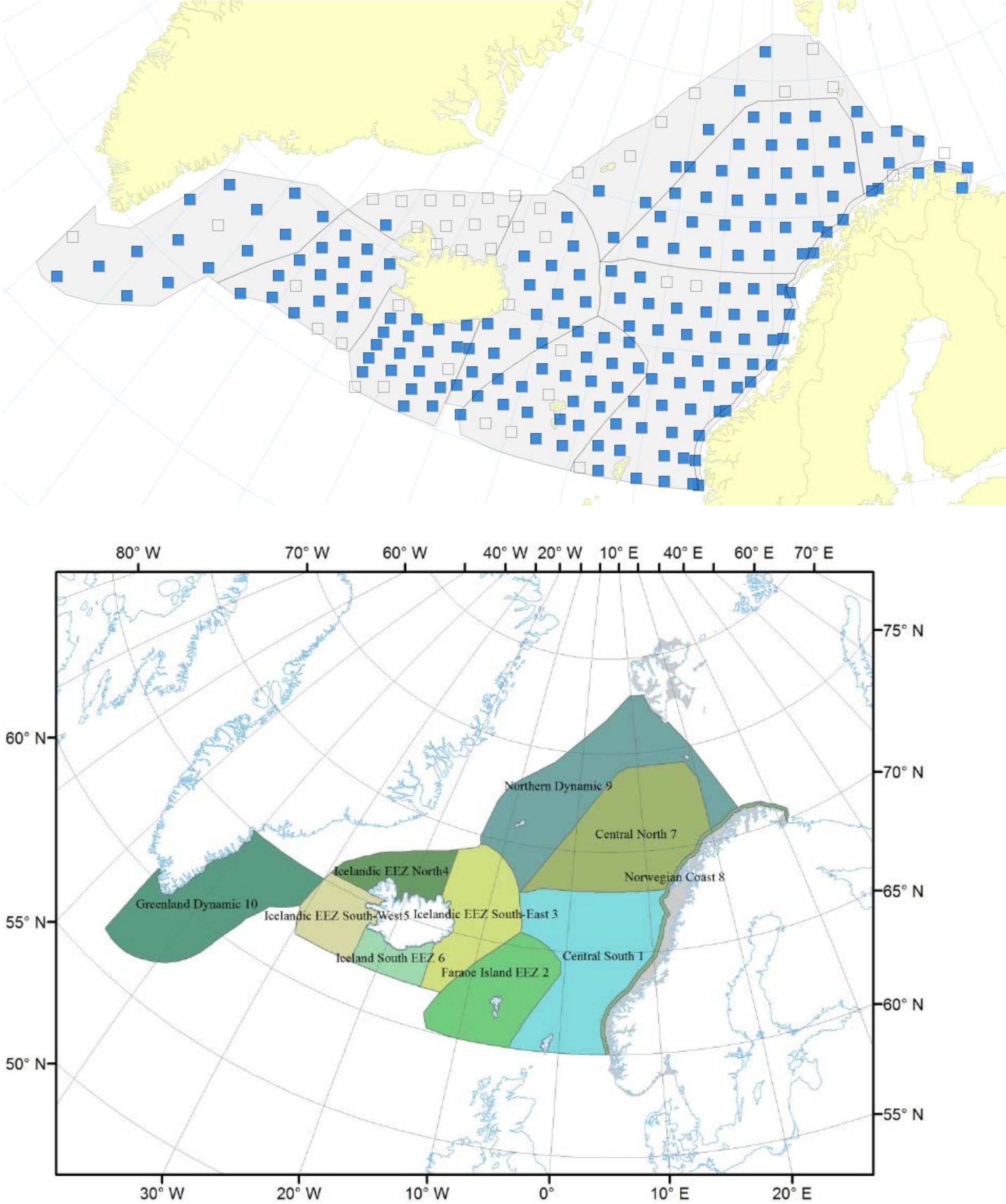


Figure 7. IESSNS 2015. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch. The lower figure shows strata numbers.

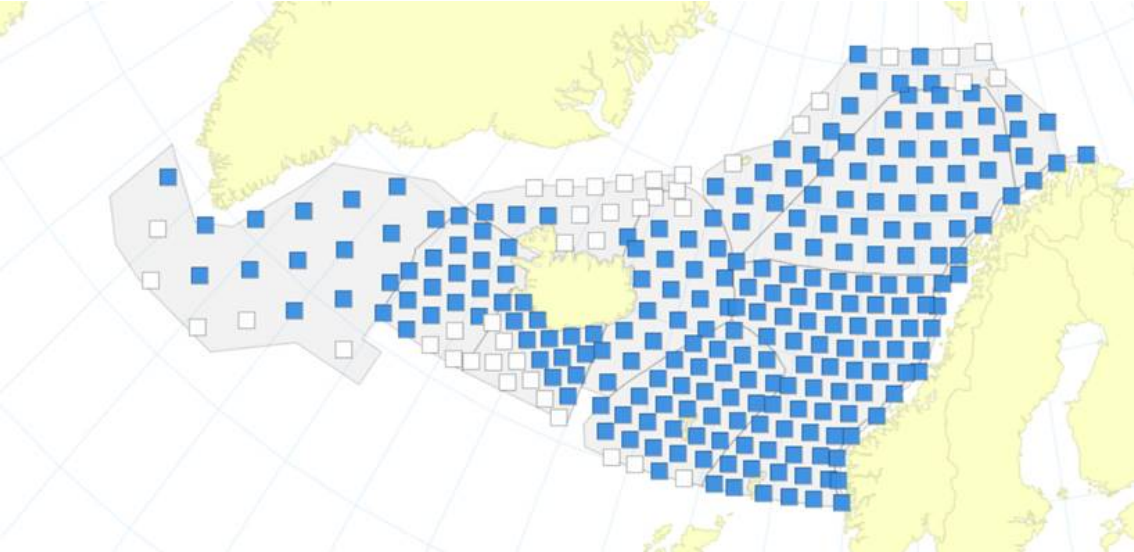


Figure 8. IESSNS 2016. Strata used in StoX. In the figure at the top trawl stations are shown; white stations indicate zero catch of mackerel while blue indicate occurrence of mackerel in the catch . Strata numbers are identical to 2015 shown in the Figure 7 above.

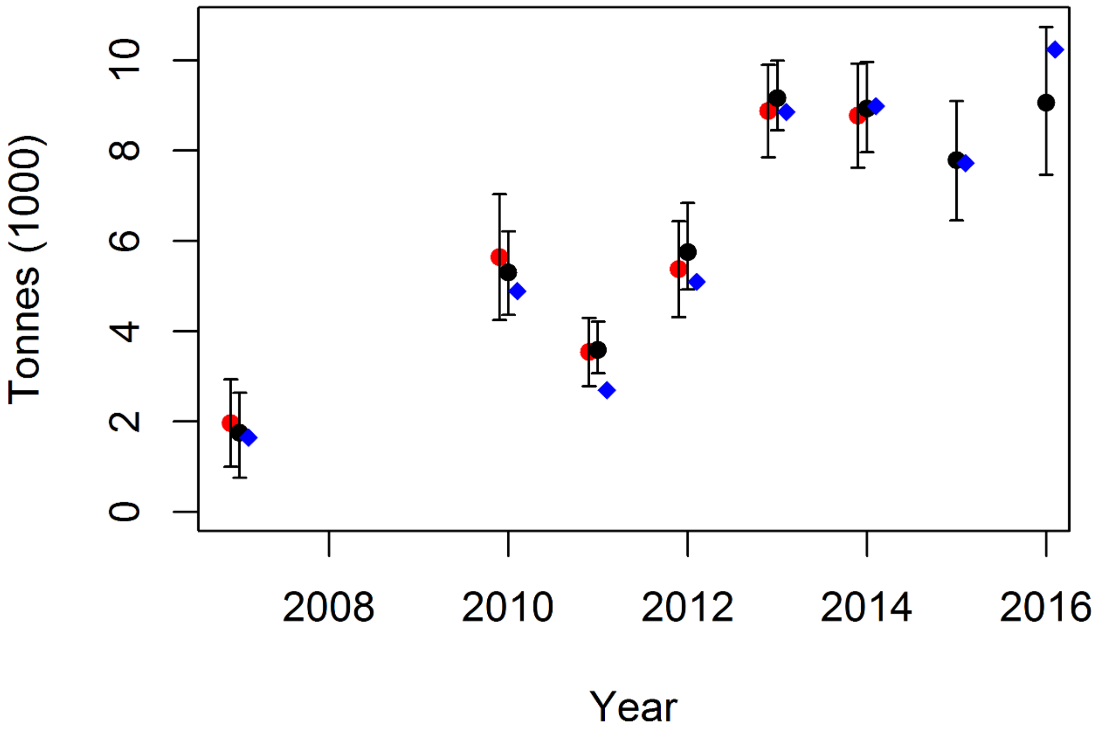


Figure 9. Total stock biomass (TSB) from StoX (black dots), Nøttestad et al. (2016) (red dots) and IESSNS cruise reports (blue diamonds). The error bars represent approximate 90 % confidence intervals.

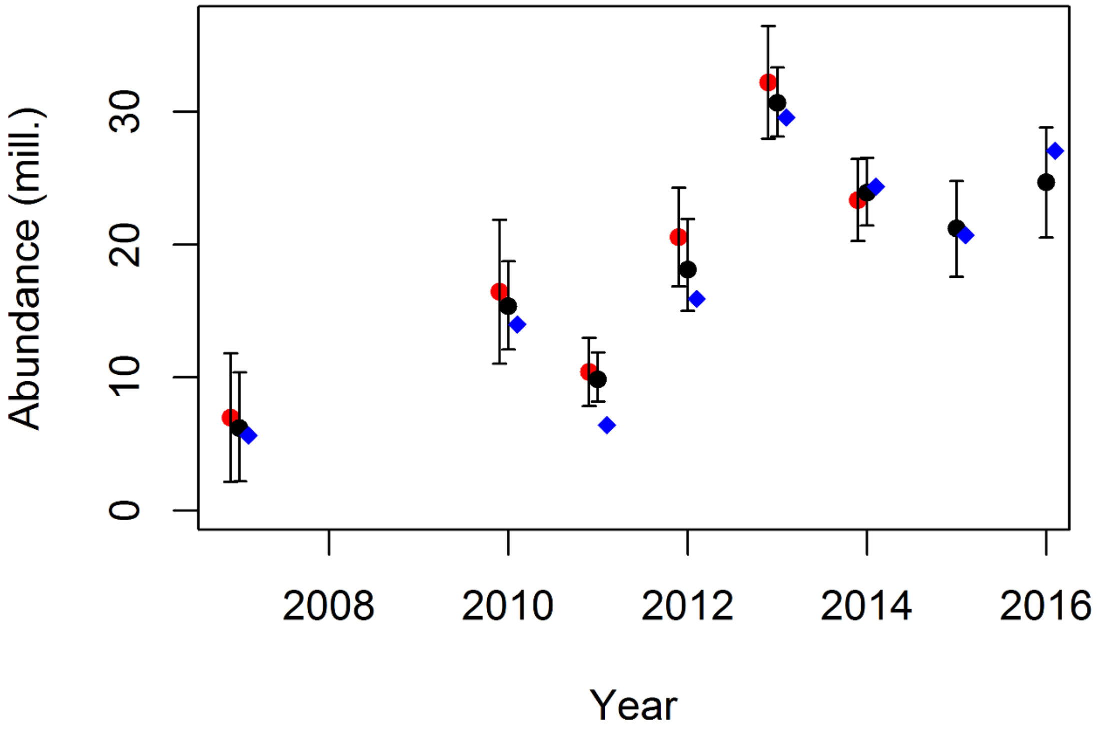


Figure 10. Total stock number (TSN) from StoX (black dots), Nøttestad et al. (2016) (red dots) and IESSNS cruise reports (blue diamonds). The error bars represent approximate 90 % confidence intervals.

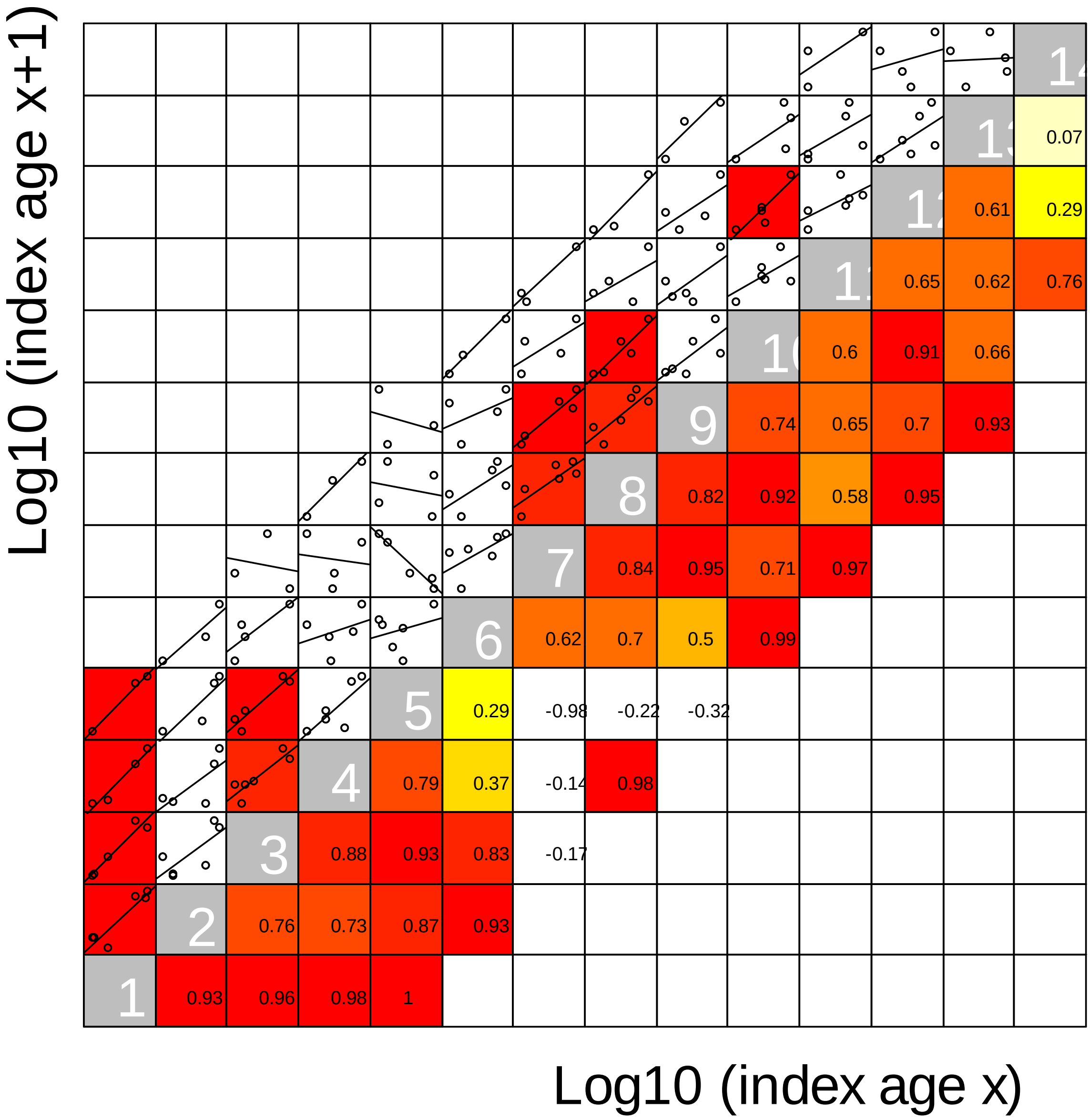


Figure 11. Internal consistency of the abundance estimates from StoX.

Appendix 1

Year	Cruise	Station	Startdate
2007	2007831	1	16/07/2007
2007	2007831	3	16/07/2007
2007	2007831	5	16/07/2007
2007	2007831	6	17/07/2007
2007	2007831	8	18/07/2007
2007	2007831	9	18/07/2007
2007	2007831	10	18/07/2007
2007	2007831	11	18/07/2007
2007	2007831	12	19/07/2007
2007	2007831	13	19/07/2007
2007	2007831	15	19/07/2007
2007	2007831	16	19/07/2007
2007	2007831	17	20/07/2007
2007	2007831	18	20/07/2007
2007	2007831	20	20/07/2007
2007	2007831	21	21/07/2007
2007	2007831	23	21/07/2007
2007	2007831	24	21/07/2007
2007	2007831	25	22/07/2007
2007	2007831	27	22/07/2007
2007	2007831	28	22/07/2007
2007	2007831	29	22/07/2007
2007	2007831	30	23/07/2007
2007	2007831	32	23/07/2007
2007	2007831	33	23/07/2007
2007	2007831	34	23/07/2007
2007	2007831	35	25/07/2007
2007	2007831	36	26/07/2007
2007	2007831	37	26/07/2007
2007	2007831	38	26/07/2007
2007	2007831	39	27/07/2007
2007	2007831	40	27/07/2007
2007	2007831	42	27/07/2007
2007	2007831	43	28/07/2007
2007	2007831	45	28/07/2007
2007	2007831	46	28/07/2007
2007	2007831	47	29/07/2007
2007	2007831	48	29/07/2007
2007	2007831	49	29/07/2007
2007	2007831	50	29/07/2007
2007	2007831	51	30/07/2007
2007	2007831	52	30/07/2007
2007	2007831	53	30/07/2007
2007	2007831	54	31/07/2007
2007	2007831	55	31/07/2007
2007	2007831	56	31/07/2007
2007	2007831	57	01/08/2007
2007	2007831	58	01/08/2007
2007	2007831	60	01/08/2007
2007	2007831	61	01/08/2007
2007	2007831	62	02/08/2007
2007	2007831	63	02/08/2007
2007	2007831	64	02/08/2007
2007	2007831	65	02/08/2007
2007	2007831	66	03/08/2007
2007	2007831	67	04/08/2007
2007	2007831	68	04/08/2007
2007	2007831	1	16/07/2007
2007	2007831	2	16/07/2007
2007	2007831	3	16/07/2007
2007	2007831	4	16/07/2007
2007	2007831	5	17/07/2007
2007	2007831	6	17/07/2007
2007	2007831	7	17/07/2007
2007	2007831	8	17/07/2007
2007	2007831	9	17/07/2007
2007	2007831	11	18/07/2007
2007	2007831	12	18/07/2007
2007	2007831	13	18/07/2007
2007	2007831	14	18/07/2007
2007	2007831	15	19/07/2007
2007	2007831	16	19/07/2007
2007	2007831	17	19/07/2007
2007	2007831	18	19/07/2007
2007	2007831	19	20/07/2007
2007	2007831	20	20/07/2007
2007	2007831	21	20/07/2007
2007	2007831	23	21/07/2007
2007	2007831	24	21/07/2007
2007	2007831	25	21/07/2007
2007	2007831	26	21/07/2007
2007	2007831	27	22/07/2007
2007	2007831	28	22/07/2007
2007	2007831	29	22/07/2007
2007	2007831	30	22/07/2007
2007	2007831	31	23/07/2007
2007	2007831	32	23/07/2007
2007	2007831	33	23/07/2007
2007	2007831	34	24/07/2007
2007	2007831	35	25/07/2007
2007	2007831	36	26/07/2007
2007	2007831	37	26/07/2007
2007	2007831	38	26/07/2007
2007	2007831	39	27/07/2007
2007	2007831	40	27/07/2007
2007	2007831	41	27/07/2007
2007	2007831	42	27/07/2007
2007	2007831	43	28/07/2007
2007	2007831	44	28/07/2007
2007	2007831	45	29/07/2007
2007	2007831	46	29/07/2007
2007	2007831	47	30/07/2007
2007	2007831	48	30/07/2007
2007	2007831	49	30/07/2007
2007	2007831	50	31/07/2007
2007	2007831	51	31/07/2007
2007	2007831	52	01/08/2007
2007	2007831	53	01/08/2007
2007	2007831	54	01/08/2007
2007	2007831	55	02/08/2007
2007	2007831	56	02/08/2007
2007	2007831	58	03/08/2007
2007	2007831	59	04/08/2007
2007	2007831	60	04/08/2007
2007	2007831	61	05/08/2007
2010	1051	1	09/07/2010
2010	1051	3	10/07/2010
2010	1051	5	10/07/2010
2010	1051	7	11/07/2010
2010	1051	9	11/07/2010
2010	1051	13	11/07/2010
2010	1051	15	12/07/2010
2010	1051	17	12/07/2010
2010	1051	19	12/07/2010

Year	Cruise	Station	Startdate
2010	1051	21	13/07/2010
2010	1051	23	13/07/2010
2010	1051	26	13/07/2010
2010	1051	28	14/07/2010
2010	1051	30	14/07/2010
2010	1051	32	14/07/2010
2010	1051	34	15/07/2010
2010	1051	36	15/07/2010
2010	1051	40	16/07/2010
2010	1051	43	17/07/2010
2010	1051	44	17/07/2010
2010	1051	46	18/07/2010
2010	1051	48	18/07/2010
2010	1051	51	18/07/2010
2010	1051	57	19/07/2010
2010	1051	53	19/07/2010
2010	1051	55	19/07/2010
2010	1051	59	20/07/2010
2010	1051	61	20/07/2010
2010	1051	64	21/07/2010
2010	1051	66	21/07/2010
2010	1051	68	21/07/2010
2010	A10-2010	394	20/07/2010
2010	A10-2010	396	20/07/2010
2010	A10-2010	397	21/07/2010
2010	A10-2010	399	21/07/2010
2010	A10-2010	400	21/07/2010
2010	A10-2010	403	21/07/2010
2010	A10-2010	404	21/07/2010
2010	A10-2010	406	22/07/2010
2010	A10-2010	408	22/07/2010
2010	A10-2010	409	22/07/2010
2010	A10-2010	411	22/07/2010
2010	A10-2010	412	22/07/2010
2010	A10-2010	413	23/07/2010
2010	A10-2010	414	23/07/2010
2010	A10-2010	416	23/07/2010
2010	A10-2010	417	23/07/2010
2010	A10-2010	418	23/07/2010
2010	A10-2010	420	24/07/2010
2010	A10-2010	421	24/07/2010
2010	A10-2010	423	24/07/2010
2010	A10-2010	424	24/07/2010
2010	A10-2010	426	25/07/2010
2010	A10-2010	427	25/07/2010
2010	A10-2010	429	25/07/2010
2010	A10-2010	430	25/07/2010
2010	A10-2010	432	27/07/2010
2010	A10-2010	433	27/07/2010
2010	A10-2010	435	27/07/2010
2010	A10-2010	437	27/07/2010
2010	A10-2010	438	27/07/2010
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2010	A10-2010	441	28/07/2010
2010	A10-2010	442	28/07/2010
2010	A10-2010	444	28/07/2010
2010	A10-2010	446	28/07/2010
2010	A10-2010	447	28/07/2010
2010	A10-2010	449	28/07/2010
2010	A10-2010	450	29/07/2010
2010	A10-2010	452	29/07/2010
2010	A10-2010	453	29/07/2010
2010	A10-2010	456	30/07/2010
2010	A10-2010	457	30/07/2010
2010	A10-2010	459	30/07/2010
2010	A10-2010	461	30/07/2010
2010	A10-2010	462	31/07/2010
2010	A10-2010	463	31/07/2010
2010	A10-2010	465	31/07/2010
2010	A10-2010	466	31/07/2010
2010	A10-2010	467	31/07/2010
2010	A10-2010	469	01/08/2010
2010	A10-2010	470	01/08/2010
2010	A10-2010	472	01/08/2010
2010	A10-2010	473	01/08/2010
2010	A10-2010	475	02/08/2010
2010	A10-2010	476	02/08/2010
2010	A10-2010	478	02/08/2010
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2010	A10-2010	481	02/08/2010
2010	A10-2010	484	02/08/2010
2010	A10-2010	486	03/08/2010
2010	A10-2010	488	03/08/2010
2010	A10-2010	490	03/08/2010
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2010	A10-2010	496	04/08/2010
2010	A10-2010	498	04/08/2010
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2010	A10-2010	502	04/08/2010
2010	A10-2010	504	04/08/2010
2010	A10-2010	506	05/08/2010
2010	A10-2010	508	05/08/2010
2010	A10-2010	510	05/08/2010
2010	A10-2010	512	05/08/2010
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2010	A10-2010	516	06/08/2010
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2010	A10-2010	520	06/08/2010
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2010	A10-2010	524	06/08/2010
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2010	A10-2010	528	07/08/2010
2010	A10-2010	530	07/08/2010
2010	A10-2010	533	07/08/2010
2010	A10-2010	532	07/08/2010
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2010	A10-2010	551	09/08/2010
2010	A10-2010	553	09/08/2010
2010	A10-2010	555	09/08/2010
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2010	A10-2010	559	10/08/2010
2010	A10-2010	561	10/08/2010
2010	A10-2010	563	10/08/2010
2010	A10-2010	565	10/08/2010
2010	A10-2010	567	10/08/2010
2010	A10-2010	569	10/08/2010
2010	A10-2010	571	11/08/2010
2010	A10-2010	573	11/08/2010
2010	A10-2010	575	11/08/2010
2010	A10-2010	577	11/08/2010
2010	A10-2010	579	11/08/2010

Year	Cruise	Station	Startdate
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2010	A10-2010	583	12/08/2010
2010	2010807	1	15/07/2010
2010	2010807	2	16/07/2010
2010	2010807	3	16/07/2010
2010	2010807	4	16/07/2010
2010	2010807	5	16/07/2010
2010	2010807	6	17/07/2010
2010	2010807	7	17/07/2010
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2010	2010807	10	18/07/2010
2010	2010807	11	18/07/2010
2010	2010807	12	18/07/2010
2010	2010807	13	18/07/2010
2010	2010807	14	18/07/2010
2010	2010807	15	19/07/2010
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2010	2010807	20	20/07/2010
2010	2010807	21	20/07/2010
2010	2010807	22	21/07/2010
2010	2010807	23	21/07/2010
2010	2010807	24	21/07/2010
2010	2010807	25	21/07/2010
2010	2010807	26	22/07/2010
2010	2010807	27	22/07/2010
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2010	2010807	31	23/07/2010
2010	2010807	32	23/07/2010
2010	2010807	33	23/07/2010
2010	2010807	34	24/07/2010
2010	2010807	36	24/07/2010
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2010	2010807	39	27/07/2010
2010	2010807	40	27/07/2010
2010	2010807	42	27/07/2010
2010	2010807	43	27/07/2010
2010	2010807	44	28/07/2010
2010	2010807	46	28/07/2010
2010	2010807	47	28/07/2010
2010	2010807	48	29/07/2010
2010	2010807	49	29/07/2010
2010	2010807	50	29/07/2010
2010	2010807	51	29/07/2010
2010	2010807	52	30/07/2010
2010	2010807	53	30/07/2010
2010	2010807	54	30/07/2010
2010	2010807	55	31/07/2010
2010	2010807	56	31/07/2010
2010	2010807	57	31/07/2010
2010	2010807	58	31/07/2010
2010	2010807	59	01/08/2010
2010	2010807	60	01/08/2010
2010	2010807	61	01/08/2010
2010	2010807	62	01/08/2010
2010	2010807	63	02/08/2010
2010	2010807	64	02/08/2010
2010	2010807	65	02/08/2010
2010	2010807	66	03/08/2010
2010	2010807	67	03/08/2010
2010	2010810	1	15/07/2010
2010	2010810	2	15/07/2010
2010	2010810	3	16/07/2010
2010	2010810	4	16/07/2010
2010	2010810	5	16/07/2010
2010	2010810	6	17/07/2010
2010	2010810	7	17/07/2010
2010	2010810	8	17/07/2010
2010	2010810	9	18/07/2010
2010	2010810	10	18/07/2010
2010	2010810	11	18/07/2010
2010	2010810	12	19/07/2010
2010	2010810	13	19/07/2010
2010	2010810	14	20/07/2010
2010	2010810	16	20/07/2010
2010	2010810	17	21/07/2010
2010	2010810	18	21/07/2010
2010	2010810	19	21/07/2010
2010	2010810	20	21/07/2010
2010	2010810	21	22/07/2010
2010	2010810	22	22/07/2010
2010	2010810	23	23/07/2010
2010	2010810	24	23/07/2010
2010	2010810	26	23/07/2010
2010	2010810	27	24/07/2010
2010	2010810	28	24/07/2010
2010	2010810	29	24/07/2010
2010	2010810	30	25/07/2010
2010	2010810	31	25/07/2010
2010	2010810	32	25/07/2010
2010	2010810	33	27/07/2010
2010	2010810	34	27/07/2010
2010	2010810	35	27/07/2010
2010	2010810	36	27/07/2010
2010	2010810	37	28/07/2010
2010	2010810	38	28/07/2010
2010	2010810	39	28/07/2010
2010	2010810	40	29/07/2010
2010	2010810	41	29/07/2010
2010	2010810	42	29/07/2010
2010	2010810	43	29/07/2010
2010	2010810	44	30/07/2010
2010	2010810	45	30/07/2010
2010	2010810	46	30/07/2010
2010	2010810	47	31/07/2010
2010	2010810	48	31/07/2010
2010	2010810	49	31/07/2010
2010	2010810	50	01/08/2010
2010	2010810	51	01/08/2010
2010	2010810	52	01/08/2010
2010	2010810	53	01/08/2010
2010	2010810	54	02/08/2010
2010	2010810	55	02/08/2010
2010	2010810	56	02/08/2010
2010	2010810	57	03/08/2010
2010	2010810	58	03/08/2010
2010	2010810	59	04/08/2010
2010	2010810	60	08/08/2010
2010	2010810	62	08/08/2010
2010	2010810	63	08/08/2010
2010	2010810	64	08/08/2010
2010	2010810	66	09/08/2010
2010	2010810	67	09/08/2010
2010	2010810	68	10/08/2010
2010	2010810	69	10/08/2010
2010	2010810	70	10/08/2010

Year	Cruise	Station	Startdate
2010	2010810	71	11/08/2010
2010	2010810	74	11/08/2010
2010	2010810	75	12/08/2010
2010	2010810	76	12/08/2010
2010	2010810	77	12/08/2010
2010	2010810	78	13/08/2010
2010	2010810	79	13/08/2010
2010	2010810	80	13/08/2010
2010	2010810	81	14/08/2010
2010	2010810	82	14/08/2010
2010	2010810	83	14/08/2010
2010	2010810	84	14/08/2010
2010	2010810	85	15/08/2010
2010	2010810	86	15/08/2010
2010	2010810	87	16/08/2010
2010	2010810	88	16/08/2010
2010	2010810	89	16/08/2010
2010	2010810	90	16/08/2010
2010	2010810	91	17/08/2010
2010	2010810	92	17/08/2010
2010	2010810	93	18/08/2010
2010	2010810	95	18/08/2010
2011	1152	2	14/07/2011
2011	1152	8	15/07/2011
2011	1152	5	15/07/2011
2011	1152	17	17/07/2011
2011	1152	22	19/07/2011
2011	1152	25	19/07/2011
2011	1152	28	19/07/2011
2011	1152	32	20/07/2011
2011	1152	35	20/07/2011
2011	1152	38	21/07/2011
2011	1152	41	21/07/2011
2011	1152	44	21/07/2011
2011	1152	47	22/07/2011
2011	1152	50	22/07/2011
2011	1152	54	23/07/2011
2011	1152	57	23/07/2011
2011	1152	60	24/07/2011
2011	1152	63	24/07/2011
2011	1152	66	25/07/2011
2011	A8-2011	354	04/08/2011
2011	A8-2011	356	04/08/2011
2011	A8-2011	359	04/08/2011
2011	A8-2011	361	05/08/2011
2011	A8-2011	363	05/08/2011
2011	A8-2011	365	05/08/2011
2011	A8-2011	367	05/08/2011
2011	A8-2011	369	06/08/2011
2011	A8-2011	371	06/08/2011
2011	A8-2011	373	06/08/2011
2011	A8-2011	377	06/08/2011
2011	A8-2011	379	07/08/2011
2011	A8-2011	381	07/08/2011
2011	A8-2011	384	07/08/2011
2011	A8-2011	386	07/08/2011
2011	A8-2011	388	07/08/2011
2011	A8-2011	390	08/08/2011
2011	A8-2011	392	08/08/2011
2011	A8-2011	394	08/08/2011
2011	A8-2011	397	08/08/2011
2011	A8-2011	399	09/08/2011
2011	A8-2011	401	09/08/2011
2011	A8-2011	403	09/08/2011
2011	A8-2011	405	09/08/2011
2011	A8-2011	407	09/08/2011
2011	A8-2011	409	10/08/2011
2011	A8-2011	411	10/08/2011
2011	A8-2011	414	10/08/2011
2011	A8-2011	417	10/08/2011
2011	A8-2011	420	11/08/2011
2011	A8-2011	425	11/08/2011
2011	A8-2011	428	11/08/2011
2011	A8-2011	429	12/08/2011
2011	A8-2011	431	12/08/2011
2011	A8-2011	433	12/08/2011
2011	A8-2011	435	12/08/2011
2011	A8-2011	437	12/08/2011
2011	A8-2011	439	13/08/2011
2011	A8-2011	441	13/08/2011
2011	A8-2011	443	13/08/2011
2011	A8-2011	445	13/08/2011
2011	A8-2011	448	13/08/2011
2011	A8-2011	453	14/08/2011
2011	A8-2011	459	14/08/2011
2011	A8-2011	461	14/08/2011
2011	A8-2011	463	14/08/2011
2011	A8-2011	467	16/08/2011
2011	A8-2011	469	16/08/2011
2011	A8-2011	472	16/08/2011
2011	A8-2011	476	16/08/2011
2011	A8-2011	479	17/08/2011
2011	A8-2011	484	17/08/2011
2011	A8-2011	487	17/08/2011
2011	A8-2011	489	18/08/2011
2011	A8-2011	491	18/08/2011
2011	A8-2011	493	18/08/2011
2011	A8-2011	496	18/08/2011
2011	A8-2011	500	18/08/2011
2011	A8-2011	505	19/08/2011
2011	A8-2011	508	19/08/2011
2011	A8-2011	510	19/08/2011
2011	A8-2011	512	20/08/2011
2011	A8-2011	514	20/08/2011
2011	A8-2011	516	20/08/2011
2011	A8-2011	518	20/08/2011
2011	A8-2011	520	21/08/2011
2011	A8-2011	524	21/08/2011
2011	A8-2011	527	21/08/2011
2011	A8-2011	529	21/08/2011
2011	A8-2011	531	22/08/2011
2011	A8-2011	533	22/08/2011
2011	A8-2011	535	22/08/2011
2011	A8-2011	537	22/08/2011
2011	A8-2011	539	22/08/2011
2011	A8-2011	542	23/08/2011
2011	A8-2011	546	23/08/2011
2011	A8-2011	549	23/08/2011
2011	A8-2011	553	23/08/2011
2011	A8-2011	555	24/08/2011
2011	A8-2011	557	24/08/2011
2011	A8-2011	559	24/08/2011
2011	A8-2011	561	24/08/2011
2011	A8-2011	563	25/08/2011
2011	A8-2011	565	25/08/2011
2011	A8-2011	567	25/08/2011
2011	A8-2011	569	27/08/2011
2011	A8-2011	571	27/08/2011
2011	A8-2011	573	27/08/2011
2011	A8-2011	576	28/08/2011
2011	A8-2011	579	28/08/2011
2011	A8-2011	582	28/08/2011
2011	A8-2011	584	28/08/2011
2011	A8-2011	586	28/08/2011
2011	A8-2011	588	29/08/2011
2011	A8-2011	590	29/08/2011
2011	A8-2011	592	29/08/2011
2011	A8-2011	596	29/08/2011

Year	Cruise	Station	Startdate
2011	A8-2011	599	29/08/2011
2011	A8-2011	601	30/08/2011
2011	A8-2011	603	30/08/2011
2011	A8-2011	607	30/08/2011
2011	A8-2011	609	30/08/2011
2011	A8-2011	611	30/08/2011
2011	2011826	1	19/07/2011
2011	2011826	2	19/07/2011
2011	2011826	3	19/07/2011
2011	2011826	4	19/07/2011
2011	2011826	5	20/07/2011
2011	2011826	6	20/07/2011
2011	2011826	7	20/07/2011
2011	2011826	8	22/07/2011
2011	2011826	9	22/07/2011
2011	2011826	10	22/07/2011
2011	2011826	12	22/07/2011
2011	2011826	13	23/07/2011
2011	2011826	14	23/07/2011
2011	2011826	15	23/07/2011
2011	2011826	16	24/07/2011
2011	2011826	17	24/07/2011
2011	2011826	19	25/07/2011
2011	2011826	20	25/07/2011
2011	2011826	21	25/07/2011
2011	2011826	22	25/07/2011
2011	2011826	23	26/07/2011
2011	2011826	24	27/07/2011
2011	2011826	25	27/07/2011
2011	2011826	26	27/07/2011
2011	2011826	27	28/07/2011
2011	2011826	29	28/07/2011
2011	2011826	30	28/07/2011
2011	2011826	31	29/07/2011
2011	2011826	32	29/07/2011
2011	2011826	33	29/07/2011
2011	2011826	34	29/07/2011
2011	2011826	35	30/07/2011
2011	2011826	36	30/07/2011
2011	2011826	37	31/07/2011
2011	2011826	38	31/07/2011
2011	2011826	39	31/07/2011
2011	2011826	40	01/08/2011
2011	2011826	41	01/08/2011
2011	2011826	42	01/08/2011
2011	2011826	43	02/08/2011
2011	2011826	44	02/08/2011
2011	2011826	45	02/08/2011
2011	2011826	46	03/08/2011
2011	2011826	47	03/08/2011
2011	2011826	48	04/08/2011
2011	2011826	49	04/08/2011
2011	2011826	50	04/08/2011
2011	2011826	51	05/08/2011
2011	2011826	52	05/08/2011
2011	2011826	53	05/08/2011
2011	2011826	54	06/08/2011
2011	2011826	55	06/08/2011
2011	2011826	56	07/08/2011
2011	2011826	57	07/08/2011
2011	2011826	58	07/08/2011
2011	2011826	59	08/08/2011
2011	2011826	60	08/08/2011
2011	2011826	61	09/08/2011
2012	1252	1	05/07/2012
2012	1252	3	05/07/2012
2012	1252	5	05/07/2012
2012	1252	7	06/07/2012
2012	1252	9	06/07/2012
2012	1252	11	06/07/2012
2012	1252	13	07/07/2012
2012	1252	15	07/07/2012
2012	1252	18	08/07/2012
2012	1252	20	08/07/2012
2012	1252	22	08/07/2012
2012	1252	24	09/07/2012
2012	1252	26	09/07/2012
2012	1252	28	09/07/2012
2012	1252	30	10/07/2012
2012	1252	32	10/07/2012
2012	1252	34	10/07/2012
2012	1252	36	11/07/2012
2012	1252	38	11/07/2012
2012	1252	40	11/07/2012
2012	1252	42	12/07/2012
2012	1252	44	12/07/2012
2012	1252	46	13/07/2012
2012	1252	48	13/07/2012
2012	1252	50	13/07/2012
2012	1252	52	14/07/2012
2012	1252	54	14/07/2012
2012	1252	56	15/07/2012
2012	A8-2012	310	13/07/2012
2012	A8-2012	311	13/07/2012
2012	A8-2012	313	14/07/2012
2012	A8-2012	314	14/07/2012
2012	A8-2012	315	14/07/2012
2012	A8-2012	312	14/07/2012
2012	A8-2012	316	14/07/2012
2012	A8-2012	317	15/07/2012
2012	A8-2012	318	15/07/2012
2012	A8-2012	327	18/07/2012
2012	A8-2012	328	18/07/2012
2012	A8-2012	329	19/07/2012
2012	A8-2012	330	19/07/2012
2012	A8-2012	331	19/07/2012
2012	A8-2012	332	19/07/2012
2012	A8-2012	333	20/07/2012
2012	A8-2012	334	20/07/2012
2012	A8-2012	335	20/07/2012
2012	A8-2012	336	20/07/2012
2012	A8-2012	337	21/07/2012
2012	A8-2012	338	21/07/2012
2012	A8-2012	339	21/07/2012
2012	A8-2012	340	21/07/2012
2012	A8-2012	341	22/07/2012
2012	A8-2012	342	22/07/2012
2012	A8-2012	343	22/07/2012
2012	A8-2012	344	22/07/2012
2012	A8-2012	345	22/07/2012
2012	A8-2012	346	23/07/2012
2012	A8-2012	347	23/07/2012
2012	A8-2012	348	23/07/2012
2012	A8-2012	349	23/07/2012
2012	A8-2012	350	23/07/2012
2012	A8-2012	351	24/07/2012
2012	A8-2012	352	24/07/2012
2012	A8-2012	353	26/07/2012
2012	A8-2012	354	26/07/2012
2012	A8-2012	355	26/07/2012
2012	A8-2012	356	26/07/2012
2012	A8-2012	358	28/07/2012
2012	A8-2012	360	28/07/2012
2012	A8-2012	362	28/07/2012
2012	A8-2012	363	28/07/2012
2012	A8-2012	364	29/07/2012
2012	A8-2012	365	29/07/2012
2012	A8-2012	366	29/07/2012

Year	Cruise	Station	Startdate
2012	A8-2012	367	29/07/2012
2012	A8-2012	368	30/07/2012
2012	A8-2012	369	30/07/2012
2012	A8-2012	370	30/07/2012
2012	A8-2012	371	30/07/2012
2012	A8-2012	372	31/07/2012
2012	A8-2012	373	31/07/2012
2012	A8-2012	374	31/07/2012
2012	A8-2012	375	31/07/2012
2012	A8-2012	376	31/07/2012
2012	A8-2012	377	01/08/2012
2012	A8-2012	378	01/08/2012
2012	A8-2012	379	01/08/2012
2012	A8-2012	380	01/08/2012
2012	A8-2012	381	01/08/2012
2012	A8-2012	382	02/08/2012
2012	A8-2012	383	02/08/2012
2012	A8-2012	384	02/08/2012
2012	A8-2012	385	02/08/2012
2012	A8-2012	386	03/08/2012
2012	A8-2012	387	03/08/2012
2012	A8-2012	388	03/08/2012
2012	A8-2012	389	03/08/2012
2012	A8-2012	390	04/08/2012
2012	A8-2012	391	04/08/2012
2012	A8-2012	392	04/08/2012
2012	A8-2012	393	04/08/2012
2012	A8-2012	394	04/08/2012
2012	A8-2012	395	05/08/2012
2012	A8-2012	396	05/08/2012
2012	A8-2012	397	05/08/2012
2012	A8-2012	398	05/08/2012
2012	A8-2012	399	06/08/2012
2012	A8-2012	400	06/08/2012
2012	A8-2012	401	06/08/2012
2012	A8-2012	402	06/08/2012
2012	A8-2012	403	06/08/2012
2012	A8-2012	404	07/08/2012
2012	A8-2012	405	07/08/2012
2012	A8-2012	406	07/08/2012
2012	A8-2012	407	07/08/2012
2012	A8-2012	408	07/08/2012
2012	A8-2012	409	08/08/2012
2012	A8-2012	410	08/08/2012
2012	A8-2012	411	08/08/2012
2012	A8-2012	412	09/08/2012
2012	A8-2012	413	09/08/2012
2012	A8-2012	414	09/08/2012
2012	A8-2012	415	09/08/2012
2012	A8-2012	416	09/08/2012
2012	A8-2012	417	09/08/2012
2012	2012825	1	07/07/2012
2012	2012825	2	07/07/2012
2012	2012825	3	08/07/2012
2012	2012825	4	08/07/2012
2012	2012825	5	08/07/2012
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2012	2012825	7	09/07/2012
2012	2012825	8	09/07/2012
2012	2012825	9	09/07/2012
2012	2012825	10	10/07/2012
2012	2012825	11	10/07/2012
2012	2012825	12	10/07/2012
2012	2012825	13	11/07/2012
2012	2012825	15	11/07/2012
2012	2012825	16	12/07/2012
2012	2012825	17	12/07/2012
2012	2012825	18	12/07/2012
2012	2012825	19	13/07/2012
2012	2012825	20	13/07/2012
2012	2012825	21	13/07/2012
2012	2012825	22	14/07/2012
2012	2012825	23	14/07/2012
2012	2012825	24	14/07/2012
2012	2012825	25	14/07/2012
2012	2012825	26	15/07/2012
2012	2012825	36	20/07/2012
2012	2012825	37	20/07/2012
2012	2012825	38	20/07/2012
2012	2012825	39	21/07/2012
2012	2012825	40	21/07/2012
2012	2012825	41	22/07/2012
2012	2012825	42	22/07/2012
2012	2012825	43	22/07/2012
2012	2012825	44	23/07/2012
2012	2012825	45	23/07/2012
2012	2012825	46	23/07/2012
2012	2012825	47	24/07/2012
2012	2012825	48	25/07/2012
2012	2012825	49	26/07/2012
2012	2012825	50	26/07/2012
2012	2012118	128	03/07/2012
2012	2012118	129	03/07/2012
2012	2012118	130	03/07/2012
2012	2012118	131	04/07/2012
2012	2012118	132	04/07/2012
2012	2012118	133	04/07/2012
2012	2012118	134	05/07/2012
2012	2012118	135	05/07/2012
2012	2012118	136	05/07/2012
2012	2012118	137	06/07/2012
2012	2012118	139	06/07/2012
2012	2012118	140	06/07/2012
2012	2012118	141	07/07/2012
2012	2012118	142	07/07/2012
2012	2012118	143	07/07/2012
2012	2012118	144	08/07/2012
2012	2012118	145	08/07/2012
2012	2012118	146	08/07/2012
2012	2012118	147	08/07/2012
2012	2012118	148	09/07/2012
2012	2012118	149	09/07/2012
2012	2012118	150	09/07/2012
2012	2012118	151	10/07/2012
2012	2012118	152	10/07/2012
2012	2012118	155	12/07/2012
2012	2012118	156	12/07/2012
2012	2012118	157	13/07/2012
2012	2012118	158	13/07/2012
2012	2012118	159	13/07/2012
2012	2012118	160	14/07/2012
2012	2012118	161	14/07/2012
2012	2012118	162	14/07/2012
2012	2012118	163	15/07/2012
2012	2012118	164	15/07/2012
2012	2012118	172	17/07/2012
2012	2012118	173	18/07/2012
2012	2012118	174	18/07/2012
2012	2012118	175	18/07/2012
2012	2012118	176	19/07/2012
2012	2012118	177	19/07/2012
2012	2012118	178	19/07/2012
2012	2012118	179	20/07/2012
2012	2012118	181	20/07/2012
2013	1352	1	03/07/2013
2013	1352	3	03/07/2013
2013	1352	5	03/07/2013
2013	1352	7	04/07/2013

Year	Cruise	Station	Startdate
2013	1352	9	04/07/2013
2013	1352	11	04/07/2013
2013	1352	13	05/07/2013
2013	1352	15	05/07/2013
2013	1352	18	06/07/2013
2013	1352	20	06/07/2013
2013	1352	22	06/07/2013
2013	1352	24	06/07/2013
2013	1352	28	07/07/2013
2013	1352	30	07/07/2013
2013	1352	32	08/07/2013
2013	1352	34	08/07/2013
2013	1352	36	08/07/2013
2013	1352	46	09/07/2013
2013	1352	39	09/07/2013
2013	1352	41	09/07/2013
2013	1352	43	09/07/2013
2013	1352	52	10/07/2013
2013	1352	54	10/07/2013
2013	1352	63	11/07/2013
2013	1352	56	11/07/2013
2013	1352	58	11/07/2013
2013	1352	60	11/07/2013
2013	1352	66	12/07/2013
2013	1352	68	12/07/2013
2013	1352	71	13/07/2013
2013	1352	73	13/07/2013
2013	1352	77	14/07/2013
2013	1352	79	14/07/2013
2013	1352	81	14/07/2013
2013	1352	83	14/07/2013
2013	1352	85	16/07/2013
2013	1352	87	16/07/2013
2013	A7-2013	338	11/07/2013
2013	A7-2013	339	13/07/2013
2013	A7-2013	340	13/07/2013
2013	A7-2013	341	13/07/2013
2013	A7-2013	342	13/07/2013
2013	A7-2013	343	13/07/2013
2013	A7-2013	344	14/07/2013
2013	A7-2013	345	14/07/2013
2013	A7-2013	346	14/07/2013
2013	A7-2013	348	15/07/2013
2013	A7-2013	349	15/07/2013
2013	A7-2013	347	15/07/2013
2013	A7-2013	357	16/07/2013
2013	A7-2013	358	16/07/2013
2013	A7-2013	359	17/07/2013
2013	A7-2013	360	17/07/2013
2013	A7-2013	361	17/07/2013
2013	A7-2013	362	17/07/2013
2013	A7-2013	363	18/07/2013
2013	A7-2013	364	18/07/2013
2013	A7-2013	365	18/07/2013
2013	A7-2013	366	18/07/2013
2013	A7-2013	367	19/07/2013
2013	A7-2013	368	19/07/2013
2013	A7-2013	369	19/07/2013
2013	A7-2013	370	20/07/2013
2013	A7-2013	371	20/07/2013
2013	A7-2013	372	20/07/2013
2013	A7-2013	373	20/07/2013
2013	A7-2013	374	21/07/2013
2013	A7-2013	375	21/07/2013
2013	A7-2013	376	21/07/2013
2013	A7-2013	377	21/07/2013
2013	A7-2013	378	23/07/2013
2013	A7-2013	379	23/07/2013
2013	A7-2013	380	23/07/2013
2013	A7-2013	381	24/07/2013
2013	A7-2013	382	24/07/2013
2013	A7-2013	383	24/07/2013
2013	A7-2013	384	24/07/2013
2013	A7-2013	385	24/07/2013
2013	A7-2013	386	25/07/2013
2013	A7-2013	387	25/07/2013
2013	A7-2013	388	25/07/2013
2013	A7-2013	389	25/07/2013
2013	A7-2013	390	26/07/2013
2013	A7-2013	391	26/07/2013
2013	A7-2013	392	26/07/2013
2013	A7-2013	393	26/07/2013
2013	A7-2013	394	26/07/2013
2013	A7-2013	395	27/07/2013
2013	A7-2013	396	27/07/2013
2013	A7-2013	398	27/07/2013
2013	A7-2013	399	27/07/2013
2013	A7-2013	400	28/07/2013
2013	A7-2013	401	28/07/2013
2013	A7-2013	402	28/07/2013
2013	A7-2013	403	28/07/2013
2013	A7-2013	404	28/07/2013
2013	A7-2013	405	29/07/2013
2013	A7-2013	406	29/07/2013
2013	A7-2013	407	29/07/2013
2013	A7-2013	408	29/07/2013
2013	A7-2013	409	30/07/2013
2013	A7-2013	410	30/07/2013
2013	A7-2013	411	30/07/2013
2013	A7-2013	412	30/07/2013
2013	A7-2013	413	31/07/2013
2013	A7-2013	414	31/07/2013
2013	A7-2013	415	31/07/2013
2013	A7-2013	416	31/07/2013
2013	A7-2013	417	31/07/2013
2013	A7-2013	418	01/08/2013
2013	A7-2013	419	01/08/2013
2013	A7-2013	421	01/08/2013
2013	A7-2013	422	01/08/2013
2013	A7-2013	423	01/08/2013
2013	A7-2013	424	02/08/2013
2013	A7-2013	425	02/08/2013
2013	A7-2013	426	02/08/2013
2013	A7-2013	427	02/08/2013
2013	A7-2013	428	03/08/2013
2013	A7-2013	429	03/08/2013
2013	A7-2013	430	03/08/2013
2013	A7-2013	431	03/08/2013
2013	A7-2013	432	03/08/2013
2013	A7-2013	433	04/08/2013
2013	A7-2013	434	04/08/2013
2013	A7-2013	435	04/08/2013
2013	A7-2013	436	04/08/2013
2013	A7-2013	437	05/08/2013
2013	A7-2013	438	05/08/2013
2013	A7-2013	439	05/08/2013
2013	A7-2013	440	05/08/2013
2013	A7-2013	441	06/08/2013
2013	A7-2013	442	06/08/2013
2013	A7-2013	443	06/08/2013
2013	A7-2013	444	06/08/2013
2013	A7-2013	445	06/08/2013
2013	A7-2013	446	07/08/2013
2013	A7-2013	447	07/08/2013
2013	A7-2013	448	07/08/2013
2013	A7-2013	449	07/08/2013
2013	A7-2013	450	08/08/2013
2013	2013826	8	06/07/2013

Year	Cruise	Station	Startdate
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2013	2013826	10	07/07/2013
2013	2013826	11	08/07/2013
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2013	2013826	13	08/07/2013
2013	2013826	14	08/07/2013
2013	2013826	15	08/07/2013
2013	2013826	16	09/07/2013
2013	2013826	17	09/07/2013
2013	2013826	18	09/07/2013
2013	2013826	19	10/07/2013
2013	2013826	20	10/07/2013
2013	2013826	21	10/07/2013
2013	2013826	22	11/07/2013
2013	2013826	23	11/07/2013
2013	2013826	25	11/07/2013
2013	2013826	26	11/07/2013
2013	2013826	27	12/07/2013
2013	2013826	28	12/07/2013
2013	2013826	29	12/07/2013
2013	2013826	30	13/07/2013
2013	2013826	31	13/07/2013
2013	2013826	32	13/07/2013
2013	2013826	33	14/07/2013
2013	2013826	34	14/07/2013
2013	2013826	35	14/07/2013
2013	2013826	37	15/07/2013
2013	2013826	38	15/07/2013
2013	2013826	39	15/07/2013
2013	2013826	40	16/07/2013
2013	2013826	41	16/07/2013
2013	2013826	42	16/07/2013
2013	2013826	43	16/07/2013
2013	2013826	44	17/07/2013
2013	2013826	45	17/07/2013
2013	2013826	46	17/07/2013
2013	2013826	47	17/07/2013
2013	2013826	48	18/07/2013
2013	2013826	49	18/07/2013
2013	2013826	50	18/07/2013
2013	2013826	51	19/07/2013
2013	2013826	52	20/07/2013
2013	2013826	53	20/07/2013
2013	2013826	54	20/07/2013
2013	2013826	55	20/07/2013
2013	2013826	56	21/07/2013
2013	2013826	57	21/07/2013
2013	2013826	58	21/07/2013
2013	2013826	59	21/07/2013
2013	2013826	60	22/07/2013
2013	2013826	61	22/07/2013
2013	2013826	62	22/07/2013
2013	2013826	63	22/07/2013
2013	2013826	64	23/07/2013
2013	2013826	65	23/07/2013
2013	2013826	66	23/07/2013
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2013	2013826	68	24/07/2013
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2013	2013826	72	24/07/2013
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2013	2013826	75	25/07/2013
2013	2013826	76	25/07/2013
2013	2013826	77	26/07/2013
2013	2013826	78	26/07/2013
2013	2013826	79	26/07/2013
2013	2013826	80	26/07/2013
2013	2013826	81	27/07/2013
2013	2013826	82	27/07/2013
2013	2013826	83	27/07/2013
2013	2013826	84	28/07/2013
2013	2013827	1	06/07/2013
2013	2013827	2	06/07/2013
2013	2013827	3	07/07/2013
2013	2013827	4	07/07/2013
2013	2013827	5	07/07/2013
2013	2013827	6	08/07/2013
2013	2013827	7	08/07/2013
2013	2013827	8	08/07/2013
2013	2013827	9	09/07/2013
2013	2013827	10	09/07/2013
2013	2013827	11	09/07/2013
2013	2013827	12	10/07/2013
2013	2013827	13	10/07/2013
2013	2013827	14	10/07/2013
2013	2013827	15	11/07/2013
2013	2013827	16	11/07/2013
2013	2013827	17	11/07/2013
2013	2013827	18	12/07/2013
2013	2013827	19	12/07/2013
2013	2013827	20	12/07/2013
2013	2013827	21	13/07/2013
2013	2013827	22	13/07/2013
2013	2013827	23	13/07/2013
2013	2013827	24	14/07/2013
2013	2013827	25	14/07/2013
2013	2013827	26	14/07/2013
2013	2013827	27	15/07/2013
2013	2013827	28	15/07/2013
2013	2013827	29	15/07/2013
2013	2013827	30	15/07/2013
2013	2013827	31	16/07/2013
2013	2013827	32	16/07/2013
2013	2013827	33	16/07/2013
2013	2013827	34	17/07/2013
2013	2013827	35	18/07/2013
2013	2013827	36	18/07/2013
2013	2013827	37	18/07/2013
2013	2013827	38	18/07/2013
2013	2013827	39	19/07/2013
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2013	2013827	41	19/07/2013
2013	2013827	42	20/07/2013
2013	2013827	43	20/07/2013
2013	2013827	44	20/07/2013
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2013	2013827	48	21/07/2013
2013	2013827	49	22/07/2013
2013	2013827	50	22/07/2013
2013	2013827	51	22/07/2013
2013	2013827	52	22/07/2013
2013	2013827	53	23/07/2013
2013	2013827	54	23/07/2013
2013	2013827	55	23/07/2013
2013	2013827	56	23/07/2013
2013	2013827	57	24/07/2013
2013	2013827	58	24/07/2013
2013	2013827	59	24/07/2013
2013	2013827	60	25/07/2013
2013	2013827	61	25/07/2013
2013	2013827	62	25/07/2013
2013	2013827	63	25/07/2013
2013	2013827	64	26/07/2013
2013	2013827	65	26/07/2013

Year	Cruise	Station	Startdate
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2014	1452	3	11/07/2014
2014	1452	5	12/07/2014
2014	1452	7	12/07/2014
2014	1452	9	12/07/2014
2014	1452	11	12/07/2014
2014	1452	17	13/07/2014
2014	1452	13	13/07/2014
2014	1452	15	13/07/2014
2014	1452	19	14/07/2014
2014	1452	21	14/07/2014
2014	1452	23	14/07/2014
2014	1452	31	15/07/2014
2014	1452	25	15/07/2014
2014	1452	27	15/07/2014
2014	1452	29	15/07/2014
2014	1452	33	16/07/2014
2014	1452	35	16/07/2014
2014	1452	45	17/07/2014
2014	1452	39	17/07/2014
2014	1452	41	17/07/2014
2014	1452	43	17/07/2014
2014	1452	47	18/07/2014
2014	1452	49	18/07/2014
2014	1452	51	18/07/2014
2014	1452	53	19/07/2014
2014	1452	55	19/07/2014
2014	1452	57	20/07/2014
2014	1452	61	20/07/2014
2014	1452	63	20/07/2014
2014	1452	65	21/07/2014
2014	1452	67	21/07/2014
2014	1452	69	21/07/2014
2014	A6-2014	281	11/07/2014
2014	A6-2014	282	12/07/2014
2014	A6-2014	283	12/07/2014
2014	A6-2014	284	12/07/2014
2014	A6-2014	285	12/07/2014
2014	A6-2014	286	13/07/2014
2014	A6-2014	287	13/07/2014
2014	A6-2014	288	13/07/2014
2014	A6-2014	289	13/07/2014
2014	A6-2014	290	14/07/2014
2014	A6-2014	291	14/07/2014
2014	A6-2014	292	14/07/2014
2014	A6-2014	293	14/07/2014
2014	A6-2014	294	14/07/2014
2014	A6-2014	295	15/07/2014
2014	A6-2014	296	15/07/2014
2014	A6-2014	297	15/07/2014
2014	A6-2014	298	15/07/2014
2014	A6-2014	299	16/07/2014
2014	A6-2014	300	16/07/2014
2014	A6-2014	301	16/07/2014
2014	A6-2014	302	16/07/2014
2014	A6-2014	303	16/07/2014
2014	A6-2014	304	17/07/2014
2014	A6-2014	305	17/07/2014
2014	A6-2014	306	17/07/2014
2014	A6-2014	307	17/07/2014
2014	A6-2014	308	17/07/2014
2014	A6-2014	309	18/07/2014
2014	A6-2014	310	18/07/2014
2014	A6-2014	311	18/07/2014
2014	A6-2014	312	18/07/2014
2014	A6-2014	313	19/07/2014
2014	A6-2014	314	19/07/2014
2014	A6-2014	315	19/07/2014
2014	A6-2014	316	19/07/2014
2014	A6-2014	317	19/07/2014
2014	A6-2014	318	20/07/2014
2014	A6-2014	319	20/07/2014
2014	A6-2014	320	20/07/2014
2014	A6-2014	321	20/07/2014
2014	A6-2014	322	20/07/2014
2014	A6-2014	323	21/07/2014
2014	A6-2014	324	22/07/2014
2014	A6-2014	325	22/07/2014
2014	A6-2014	326	22/07/2014
2014	A6-2014	327	22/07/2014
2014	A6-2014	328	23/07/2014
2014	A6-2014	329	23/07/2014
2014	A6-2014	330	23/07/2014
2014	A6-2014	331	23/07/2014
2014	A6-2014	332	24/07/2014
2014	A6-2014	333	24/07/2014
2014	A6-2014	334	24/07/2014
2014	A6-2014	335	24/07/2014
2014	A6-2014	336	24/07/2014
2014	A6-2014	337	25/07/2014
2014	A6-2014	338	25/07/2014
2014	A6-2014	339	25/07/2014
2014	A6-2014	340	25/07/2014
2014	A6-2014	341	26/07/2014
2014	A6-2014	342	26/07/2014
2014	A6-2014	343	26/07/2014
2014	A6-2014	344	26/07/2014
2014	A6-2014	345	27/07/2014
2014	A6-2014	346	27/07/2014
2014	A6-2014	347	27/07/2014
2014	A6-2014	348	27/07/2014
2014	A6-2014	349	28/07/2014
2014	A6-2014	350	28/07/2014
2014	A6-2014	351	28/07/2014
2014	A6-2014	352	28/07/2014
2014	A6-2014	353	29/07/2014
2014	A6-2014	354	29/07/2014
2014	A6-2014	355	29/07/2014
2014	A6-2014	356	29/07/2014
2014	A6-2014	357	30/07/2014
2014	A6-2014	358	30/07/2014
2014	A6-2014	359	30/07/2014
2014	A6-2014	360	30/07/2014
2014	A6-2014	361	31/07/2014
2014	A6-2014	362	31/07/2014
2014	A6-2014	363	31/07/2014
2014	A6-2014	364	01/08/2014
2014	A6-2014	365	01/08/2014
2014	A6-2014	366	01/08/2014
2014	A6-2014	367	02/08/2014
2014	A6-2014	368	02/08/2014
2014	A6-2014	369	02/08/2014
2014	A6-2014	370	02/08/2014
2014	A6-2014	371	03/08/2014
2014	A6-2014	372	03/08/2014
2014	A6-2014	373	03/08/2014
2014	A6-2014	374	03/08/2014
2014	A6-2014	375	04/08/2014
2014	A6-2014	378	05/08/2014
2014	A6-2014	376	05/08/2014
2014	A6-2014	377	05/08/2014
2014	A6-2014	379	06/08/2014
2014	A6-2014	380	06/08/2014
2014	A6-2014	381	06/08/2014
2014	A6-2014	382	07/08/2014
2014	A6-2014	383	07/08/2014
2014	A6-2014	384	07/08/2014

Year	Cruise	Station	Startdate
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2014	A6-2014	388	08/08/2014
2014	A6-2014	389	08/08/2014
2014	A6-2014	390	09/08/2014
2014	A6-2014	391	09/08/2014
2014	A6-2014	392	09/08/2014
2014	A6-2014	393	09/08/2014
2014	A6-2014	394	10/08/2014
2014	A6-2014	395	10/08/2014
2014	A6-2014	396	10/08/2014
2014	A6-2014	397	11/08/2014
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2014	2014812	2	03/07/2014
2014	2014812	3	03/07/2014
2014	2014812	4	03/07/2014
2014	2014812	5	04/07/2014
2014	2014812	6	04/07/2014
2014	2014812	7	04/07/2014
2014	2014812	8	05/07/2014
2014	2014812	9	05/07/2014
2014	2014812	10	05/07/2014
2014	2014812	11	05/07/2014
2014	2014812	12	06/07/2014
2014	2014812	13	06/07/2014
2014	2014812	14	06/07/2014
2014	2014812	15	06/07/2014
2014	2014812	16	07/07/2014
2014	2014812	17	07/07/2014
2014	2014812	18	07/07/2014
2014	2014812	19	08/07/2014
2014	2014812	20	08/07/2014
2014	2014812	21	08/07/2014
2014	2014812	22	08/07/2014
2014	2014812	23	09/07/2014
2014	2014812	24	09/07/2014
2014	2014812	25	09/07/2014
2014	2014812	26	09/07/2014
2014	2014812	27	10/07/2014
2014	2014812	28	10/07/2014
2014	2014812	29	10/07/2014
2014	2014812	30	10/07/2014
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2014	2014812	33	11/07/2014
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2014	2014812	37	12/07/2014
2014	2014812	38	13/07/2014
2014	2014812	39	13/07/2014
2014	2014812	40	15/07/2014
2014	2014812	41	15/07/2014
2014	2014812	42	15/07/2014
2014	2014812	43	15/07/2014
2014	2014812	44	16/07/2014
2014	2014812	45	16/07/2014
2014	2014812	46	16/07/2014
2014	2014812	47	16/07/2014
2014	2014812	48	17/07/2014
2014	2014812	49	17/07/2014
2014	2014812	50	17/07/2014
2014	2014812	51	17/07/2014
2014	2014812	52	17/07/2014
2014	2014812	53	18/07/2014
2014	2014812	54	18/07/2014
2014	2014812	55	18/07/2014
2014	2014812	56	19/07/2014
2014	2014812	57	19/07/2014
2014	2014812	58	19/07/2014
2014	2014812	59	20/07/2014
2014	2014812	60	20/07/2014
2014	2014812	61	20/07/2014
2014	2014812	62	21/07/2014
2014	2014812	63	21/07/2014
2014	2014812	64	21/07/2014
2014	2014812	65	21/07/2014
2014	2014812	66	21/07/2014
2014	2014812	67	22/07/2014
2014	2014812	68	22/07/2014
2014	2014812	69	23/07/2014
2014	2014812	70	23/07/2014
2014	2014812	71	23/07/2014
2014	2014812	72	23/07/2014
2014	2014812	73	24/07/2014
2014	2014812	74	24/07/2014
2014	2014812	75	24/07/2014
2014	2014812	76	24/07/2014
2014	2014812	77	25/07/2014
2014	2014813	2	03/07/2014
2014	2014813	3	03/07/2014
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2014	2014813	11	06/07/2014
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2014	2014813	16	08/07/2014
2014	2014813	17	08/07/2014
2014	2014813	18	09/07/2014
2014	2014813	19	09/07/2014
2014	2014813	20	09/07/2014
2014	2014813	21	09/07/2014
2014	2014813	22	10/07/2014
2014	2014813	23	10/07/2014
2014	2014813	24	11/07/2014
2014	2014813	25	11/07/2014
2014	2014813	26	11/07/2014
2014	2014813	27	12/07/2014
2014	2014813	28	12/07/2014
2014	2014813	29	13/07/2014
2014	2014813	30	13/07/2014
2014	2014813	31	15/07/2014
2014	2014813	32	15/07/2014
2014	2014813	33	16/07/2014
2014	2014813	34	16/07/2014
2014	2014813	35	16/07/2014
2014	2014813	36	17/07/2014
2014	2014813	37	17/07/2014
2014	2014813	38	17/07/2014
2014	2014813	39	18/07/2014
2014	2014813	40	18/07/2014
2014	2014813	41	18/07/2014
2014	2014813	42	19/07/2014
2014	2014813	43	19/07/2014
2014	2014813	44	20/07/2014
2014	2014813	45	20/07/2014
2014	2014813	46	20/07/2014
2014	2014813	47	21/07/2014
2014	2014813	48	21/07/2014
2014	2014813	49	21/07/2014
2014	2014813	50	22/07/2014

Year	Cruise	Station	Startdate
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2014	2014813	52	23/07/2014
2014	2014813	53	23/07/2014
2014	2014813	54	23/07/2014
2014	2014813	55	24/07/2014
2014	2014813	56	25/07/2014
2015	1552	1	03/07/2015
2015	1552	4	03/07/2015
2015	1552	6	04/07/2015
2015	1552	8	04/07/2015
2015	1552	10	04/07/2015
2015	1552	12	04/07/2015
2015	1552	14	05/07/2015
2015	1552	16	05/07/2015
2015	1552	18	05/07/2015
2015	1552	20	06/07/2015
2015	1552	22	06/07/2015
2015	1552	24	06/07/2015
2015	1552	26	06/07/2015
2015	1552	28	07/07/2015
2015	1552	30	07/07/2015
2015	1552	32	07/07/2015
2015	1552	34	08/07/2015
2015	1552	37	09/07/2015
2015	1552	39	09/07/2015
2015	1552	41	09/07/2015
2015	1552	43	10/07/2015
2015	1552	45	10/07/2015
2015	1552	47	11/07/2015
2015	1552	49	11/07/2015
2015	1552	51	11/07/2015
2015	1552	53	12/07/2015
2015	1552	55	12/07/2015
2015	1552	57	12/07/2015
2015	1552	63	13/07/2015
2015	1552	59	13/07/2015
2015	1552	61	13/07/2015
2015	1552	65	14/07/2015
2015	1552	68	14/07/2015
2015	1552	70	15/07/2015
2015	1552	72	15/07/2015
2015	1552	74	16/07/2015
2015	1552	76	16/07/2015
2015	1552	78	17/07/2015
2015	1552	80	17/07/2015
2015	1552	82	17/07/2015
2015	A7-2015	359	07/07/2015
2015	A7-2015	360	07/07/2015
2015	A7-2015	361	07/07/2015
2015	A7-2015	362	07/07/2015
2015	A7-2015	363	07/07/2015
2015	A7-2015	364	08/07/2015
2015	A7-2015	365	08/07/2015
2015	A7-2015	366	08/07/2015
2015	A7-2015	367	08/07/2015
2015	A7-2015	368	09/07/2015
2015	A7-2015	369	09/07/2015
2015	A7-2015	370	09/07/2015
2015	A7-2015	371	09/07/2015
2015	A7-2015	372	09/07/2015
2015	A7-2015	373	10/07/2015
2015	A7-2015	374	10/07/2015
2015	A7-2015	375	10/07/2015
2015	A7-2015	376	11/07/2015
2015	A7-2015	377	11/07/2015
2015	A7-2015	378	11/07/2015
2015	A7-2015	379	11/07/2015
2015	A7-2015	380	12/07/2015
2015	A7-2015	381	12/07/2015
2015	A7-2015	382	12/07/2015
2015	A7-2015	383	12/07/2015
2015	A7-2015	384	13/07/2015
2015	A7-2015	385	13/07/2015
2015	A7-2015	386	14/07/2015
2015	A7-2015	387	14/07/2015
2015	A7-2015	388	15/07/2015
2015	A7-2015	389	15/07/2015
2015	A7-2015	390	15/07/2015
2015	A7-2015	391	16/07/2015
2015	A7-2015	392	16/07/2015
2015	A7-2015	393	16/07/2015
2015	A7-2015	394	17/07/2015
2015	A7-2015	395	17/07/2015
2015	A7-2015	396	17/07/2015
2015	A7-2015	397	18/07/2015
2015	A7-2015	398	18/07/2015
2015	A7-2015	399	18/07/2015
2015	A7-2015	400	19/07/2015
2015	A7-2015	401	19/07/2015
2015	A7-2015	402	20/07/2015
2015	A7-2015	403	20/07/2015
2015	A7-2015	404	20/07/2015
2015	A7-2015	405	21/07/2015
2015	A7-2015	406	21/07/2015
2015	A7-2015	407	21/07/2015
2015	A7-2015	408	22/07/2015
2015	A7-2015	409	22/07/2015
2015	A7-2015	410	22/07/2015
2015	A7-2015	411	23/07/2015
2015	A7-2015	412	23/07/2015
2015	A7-2015	413	24/07/2015
2015	A7-2015	414	24/07/2015
2015	A7-2015	415	24/07/2015
2015	A7-2015	416	25/07/2015
2015	A7-2015	417	25/07/2015
2015	A7-2015	418	26/07/2015
2015	A7-2015	419	26/07/2015
2015	A7-2015	420	27/07/2015
2015	A7-2015	421	27/07/2015
2015	A7-2015	422	27/07/2015
2015	A7-2015	423	28/07/2015
2015	A7-2015	424	28/07/2015
2015	A7-2015	425	28/07/2015
2015	A7-2015	426	28/07/2015
2015	A7-2015	427	29/07/2015
2015	A7-2015	428	29/07/2015
2015	A7-2015	429	29/07/2015
2015	A7-2015	430	30/07/2015
2015	A7-2015	431	30/07/2015
2015	A7-2015	432	30/07/2015
2015	A7-2015	435	31/07/2015
2015	A7-2015	433	31/07/2015
2015	A7-2015	434	31/07/2015
2015	A7-2015	436	01/08/2015
2015	A7-2015	439	02/08/2015
2015	A7-2015	438	02/08/2015
2015	A7-2015	437	02/08/2015
2015	A7-2015	441	03/08/2015
2015	A7-2015	440	03/08/2015
2015	A7-2015	442	04/08/2015
2015	A7-2015	443	04/08/2015
2015	A7-2015	463	05/08/2015
2015	A7-2015	467	06/08/2015
2015	A7-2015	465	06/08/2015
2015	A7-2015	468	07/08/2015
2015	A7-2015	490	09/08/2015
2015	A7-2015	489	09/08/2015
2015	A7-2015	491	10/08/2015

Year	Cruise	Station	Startdate
2015	2015832	1	03/07/2015
2015	2015832	2	03/07/2015
2015	2015832	3	04/07/2015
2015	2015832	4	04/07/2015
2015	2015832	5	05/07/2015
2015	2015832	6	05/07/2015
2015	2015832	7	05/07/2015
2015	2015832	8	06/07/2015
2015	2015832	9	06/07/2015
2015	2015832	10	07/07/2015
2015	2015832	11	07/07/2015
2015	2015832	12	07/07/2015
2015	2015832	13	08/07/2015
2015	2015832	14	08/07/2015
2015	2015832	15	08/07/2015
2015	2015832	16	08/07/2015
2015	2015832	17	09/07/2015
2015	2015832	18	09/07/2015
2015	2015832	19	09/07/2015
2015	2015832	20	11/07/2015
2015	2015832	21	11/07/2015
2015	2015832	23	12/07/2015
2015	2015832	24	12/07/2015
2015	2015832	25	12/07/2015
2015	2015832	27	13/07/2015
2015	2015832	28	13/07/2015
2015	2015832	32	16/07/2015
2015	2015832	33	16/07/2015
2015	2015832	34	17/07/2015
2015	2015832	35	17/07/2015
2015	2015832	36	17/07/2015
2015	2015832	37	18/07/2015
2015	2015832	38	18/07/2015
2015	2015832	39	19/07/2015
2015	2015832	40	19/07/2015
2015	2015832	41	19/07/2015
2015	2015832	42	20/07/2015
2015	2015832	43	21/07/2015
2015	2015832	44	21/07/2015
2015	2015832	45	22/07/2015
2015	2015832	46	22/07/2015
2015	2015832	47	23/07/2015
2015	2015832	48	23/07/2015
2015	2015832	49	24/07/2015
2015	2015832	50	24/07/2015
2015	2015832	51	24/07/2015
2015	2015832	52	24/07/2015
2015	2015832	53	25/07/2015
2015	2015832	54	25/07/2015
2015	2015832	55	26/07/2015
2015	2015832	56	26/07/2015
2015	2015832	57	26/07/2015
2015	2015831	2	02/07/2015
2015	2015831	3	02/07/2015
2015	2015831	4	03/07/2015
2015	2015831	5	03/07/2015
2015	2015831	6	03/07/2015
2015	2015831	7	03/07/2015
2015	2015831	8	04/07/2015
2015	2015831	9	04/07/2015
2015	2015831	10	05/07/2015
2015	2015831	11	05/07/2015
2015	2015831	12	05/07/2015
2015	2015831	13	06/07/2015
2015	2015831	14	07/07/2015
2015	2015831	15	07/07/2015
2015	2015831	16	07/07/2015
2015	2015831	17	08/07/2015
2015	2015831	18	09/07/2015
2015	2015831	19	09/07/2015
2015	2015831	20	09/07/2015
2015	2015831	21	10/07/2015
2015	2015831	22	10/07/2015
2015	2015831	23	11/07/2015
2015	2015831	25	11/07/2015
2015	2015831	27	12/07/2015
2015	2015831	29	12/07/2015
2015	2015831	31	13/07/2015
2015	2015831	33	13/07/2015
2015	2015831	35	14/07/2015
2015	2015831	36	15/07/2015
2015	2015831	37	16/07/2015
2015	2015831	38	16/07/2015
2015	2015831	39	17/07/2015
2015	2015831	40	17/07/2015
2015	2015831	41	17/07/2015
2015	2015831	42	18/07/2015
2015	2015831	43	18/07/2015
2015	2015831	44	19/07/2015
2015	2015831	45	19/07/2015
2015	2015831	46	20/07/2015
2015	2015831	47	21/07/2015
2015	2015831	48	21/07/2015
2015	2015831	49	22/07/2015
2015	2015831	50	22/07/2015
2015	2015831	51	23/07/2015
2015	2015831	52	24/07/2015
2015	2015831	53	24/07/2015
2015	2015831	54	26/07/2015
2016	1652	1	05/07/2016
2016	1652	4	05/07/2016
2016	1652	6	05/07/2016
2016	1652	8	06/07/2016
2016	1652	10	06/07/2016
2016	1652	12	06/07/2016
2016	1652	14	07/07/2016
2016	1652	16	07/07/2016
2016	1652	19	07/07/2016
2016	1652	21	08/07/2016
2016	1652	23	08/07/2016
2016	1652	26	08/07/2016
2016	1652	28	09/07/2016
2016	1652	30	09/07/2016
2016	1652	33	09/07/2016
2016	1652	35	10/07/2016
2016	1652	37	10/07/2016
2016	1652	40	11/07/2016
2016	1652	42	11/07/2016
2016	1652	45	12/07/2016
2016	1652	47	12/07/2016
2016	1652	49	12/07/2016
2016	1652	51	12/07/2016
2016	1652	53	13/07/2016
2016	1652	55	13/07/2016
2016	1652	57	13/07/2016
2016	1652	59	13/07/2016
2016	1652	61	14/07/2016
2016	1652	63	14/07/2016
2016	1652	65	14/07/2016
2016	1652	67	15/07/2016
2016	1652	69	15/07/2016
2016	1652	71	15/07/2016
2016	1652	73	17/07/2016
2016	1652	75	18/07/2016
2016	1652	77	18/07/2016
2016	1652	79	18/07/2016
2016	1652	81	19/07/2016
2016	1652	83	19/07/2016

Year	Cruise	Station	Startdate
2016	CH-2016-01	3	23/07/2016
2016	CH-2016-01	6	23/07/2016
2016	CH-2016-01	9	23/07/2016
2016	CH-2016-01	12	24/07/2016
2016	CH-2016-01	15	24/07/2016
2016	CH-2016-01	18	25/07/2016
2016	CH-2016-01	21	25/07/2016
2016	CH-2016-01	27	26/07/2016
2016	CH-2016-01	30	26/07/2016
2016	CH-2016-01	24	26/07/2016
2016	CH-2016-01	33	27/07/2016
2016	CH-2016-01	36	27/07/2016
2016	CH-2016-01	39	28/07/2016
2016	CH-2016-01	42	28/07/2016
2016	CH-2016-01	45	28/07/2016
2016	CH-2016-01	48	29/07/2016
2016	CH-2016-01	51	29/07/2016
2016	CH-2016-01	54	30/07/2016
2016	CH-2016-01	57	30/07/2016
2016	CH-2016-01	60	31/07/2016
2016	A8-2016	299	02/07/2016
2016	A8-2016	300	02/07/2016
2016	A8-2016	301	02/07/2016
2016	A8-2016	302	03/07/2016
2016	A8-2016	303	03/07/2016
2016	A8-2016	304	03/07/2016
2016	A8-2016	305	04/07/2016
2016	A8-2016	306	04/07/2016
2016	A8-2016	307	04/07/2016
2016	A8-2016	308	05/07/2016
2016	A8-2016	309	05/07/2016
2016	A8-2016	310	05/07/2016
2016	A8-2016	311	05/07/2016
2016	A8-2016	312	06/07/2016
2016	A8-2016	313	06/07/2016
2016	A8-2016	314	06/07/2016
2016	A8-2016	315	07/07/2016
2016	A8-2016	316	07/07/2016
2016	A8-2016	317	07/07/2016
2016	A8-2016	318	08/07/2016
2016	A8-2016	319	08/07/2016
2016	A8-2016	320	08/07/2016
2016	A8-2016	321	09/07/2016
2016	A8-2016	322	09/07/2016
2016	A8-2016	323	09/07/2016
2016	A8-2016	324	10/07/2016
2016	A8-2016	326	10/07/2016
2016	A8-2016	327	10/07/2016
2016	A8-2016	328	11/07/2016
2016	A8-2016	330	11/07/2016
2016	A8-2016	331	11/07/2016
2016	A8-2016	332	11/07/2016
2016	A8-2016	333	12/07/2016
2016	A8-2016	334	12/07/2016
2016	A8-2016	335	12/07/2016
2016	A8-2016	336	12/07/2016
2016	A8-2016	338	13/07/2016
2016	A8-2016	339	14/07/2016
2016	A8-2016	340	14/07/2016
2016	A8-2016	341	14/07/2016
2016	A8-2016	342	14/07/2016
2016	A8-2016	343	15/07/2016
2016	A8-2016	344	15/07/2016
2016	A8-2016	345	15/07/2016
2016	A8-2016	346	15/07/2016
2016	A8-2016	347	16/07/2016
2016	A8-2016	348	16/07/2016
2016	A8-2016	349	16/07/2016
2016	A8-2016	351	17/07/2016
2016	A8-2016	353	17/07/2016
2016	A8-2016	355	17/07/2016
2016	A8-2016	357	18/07/2016
2016	A8-2016	358	18/07/2016
2016	A8-2016	360	18/07/2016
2016	A8-2016	361	19/07/2016
2016	A8-2016	363	20/07/2016
2016	A8-2016	364	20/07/2016
2016	A8-2016	365	20/07/2016
2016	A8-2016	366	20/07/2016
2016	A8-2016	367	20/07/2016
2016	A8-2016	368	21/07/2016
2016	A8-2016	369	21/07/2016

Year	Cruise	Station	Startdate
2016	A8-2016	370	21/07/2016
2016	A8-2016	371	22/07/2016
2016	A8-2016	372	22/07/2016
2016	A8-2016	373	22/07/2016
2016	A8-2016	374	22/07/2016
2016	A8-2016	375	22/07/2016
2016	A8-2016	377	23/07/2016
2016	A8-2016	379	24/07/2016
2016	A8-2016	380	24/07/2016
2016	A8-2016	381	24/07/2016
2016	A8-2016	382	24/07/2016
2016	A8-2016	384	25/07/2016
2016	A8-2016	385	25/07/2016
2016	A8-2016	387	25/07/2016
2016	A8-2016	388	26/07/2016
2016	A8-2016	390	26/07/2016
2016	A8-2016	392	26/07/2016
2016	A8-2016	443	30/07/2016
2016	A8-2016	445	31/07/2016
2016	A8-2016	446	31/07/2016
2016	2016828	26	01/07/2016
2016	2016828	28	02/07/2016
2016	2016828	29	02/07/2016
2016	2016828	30	02/07/2016
2016	2016828	31	02/07/2016
2016	2016828	33	03/07/2016
2016	2016828	35	03/07/2016
2016	2016828	36	04/07/2016
2016	2016828	37	04/07/2016
2016	2016828	38	04/07/2016
2016	2016828	40	05/07/2016
2016	2016828	41	05/07/2016
2016	2016828	42	05/07/2016
2016	2016828	44	06/07/2016
2016	2016828	45	06/07/2016
2016	2016828	46	06/07/2016
2016	2016828	49	07/07/2016
2016	2016828	50	08/07/2016
2016	2016828	52	08/07/2016
2016	2016828	53	08/07/2016
2016	2016828	54	09/07/2016
2016	2016828	55	09/07/2016
2016	2016828	56	10/07/2016
2016	2016828	57	10/07/2016
2016	2016828	58	10/07/2016
2016	2016828	59	11/07/2016
2016	2016828	60	11/07/2016
2016	2016828	62	11/07/2016
2016	2016828	63	12/07/2016
2016	2016828	64	12/07/2016
2016	2016828	65	12/07/2016
2016	2016828	66	12/07/2016
2016	2016828	67	13/07/2016
2016	2016828	68	13/07/2016
2016	2016828	69	14/07/2016
2016	2016828	70	14/07/2016
2016	2016828	71	14/07/2016
2016	2016828	72	14/07/2016
2016	2016828	74	17/07/2016
2016	2016828	76	17/07/2016
2016	2016828	77	18/07/2016
2016	2016828	78	18/07/2016
2016	2016828	79	19/07/2016
2016	2016828	81	19/07/2016
2016	2016828	82	19/07/2016
2016	2016828	83	20/07/2016
2016	2016828	84	20/07/2016
2016	2016828	85	20/07/2016
2016	2016828	86	21/07/2016
2016	2016828	87	21/07/2016
2016	2016828	89	22/07/2016
2016	2016828	90	22/07/2016
2016	2016828	91	22/07/2016
2016	2016828	92	23/07/2016
2016	2016828	93	23/07/2016
2016	2016828	94	23/07/2016
2016	2016828	95	24/07/2016
2016	2016828	96	24/07/2016
2016	2016828	98	25/07/2016
2016	2016828	100	25/07/2016
2016	2016828	101	25/07/2016
2016	2016828	102	26/07/2016

Year	Cruise	Station	Startdate
2016	2016828	103	26/07/2016
2016	2016828	105	27/07/2016
2016	2016828	106	27/07/2016
2016	2016828	107	27/07/2016
2016	2016828	108	28/07/2016
2016	2016828	109	28/07/2016
2016	2016828	110	28/07/2016
2016	2016828	111	29/07/2016
2016	2016828	112	29/07/2016
2016	2016829	15	01/07/2016
2016	2016829	17	01/07/2016
2016	2016829	18	02/07/2016
2016	2016829	19	02/07/2016
2016	2016829	20	02/07/2016
2016	2016829	21	03/07/2016
2016	2016829	22	03/07/2016
2016	2016829	23	03/07/2016
2016	2016829	24	04/07/2016
2016	2016829	25	04/07/2016
2016	2016829	27	05/07/2016
2016	2016829	29	05/07/2016
2016	2016829	30	05/07/2016
2016	2016829	31	06/07/2016
2016	2016829	33	06/07/2016
2016	2016829	34	07/07/2016
2016	2016829	35	07/07/2016
2016	2016829	37	07/07/2016
2016	2016829	38	08/07/2016
2016	2016829	39	08/07/2016
2016	2016829	40	08/07/2016
2016	2016829	41	09/07/2016
2016	2016829	45	10/07/2016
2016	2016829	46	10/07/2016
2016	2016829	47	10/07/2016
2016	2016829	48	10/07/2016
2016	2016829	49	11/07/2016
2016	2016829	50	11/07/2016
2016	2016829	52	11/07/2016
2016	2016829	54	12/07/2016
2016	2016829	57	12/07/2016
2016	2016829	59	13/07/2016
2016	2016829	61	13/07/2016
2016	2016829	63	13/07/2016
2016	2016829	66	14/07/2016
2016	2016829	67	14/07/2016
2016	2016829	69	15/07/2016
2016	2016829	70	16/07/2016
2016	2016829	72	17/07/2016
2016	2016829	73	17/07/2016
2016	2016829	74	18/07/2016
2016	2016829	75	18/07/2016
2016	2016829	76	18/07/2016
2016	2016829	77	19/07/2016
2016	2016829	79	19/07/2016
2016	2016829	80	20/07/2016
2016	2016829	82	21/07/2016
2016	2016829	83	21/07/2016
2016	2016829	85	21/07/2016
2016	2016829	86	22/07/2016
2016	2016829	87	22/07/2016
2016	2016829	88	23/07/2016
2016	2016829	89	23/07/2016
2016	2016829	90	24/07/2016
2016	2016829	91	24/07/2016
2016	2016829	92	24/07/2016
2016	2016829	93	25/07/2016
2016	2016829	93	25/07/2016
2016	2016829	95	25/07/2016
2016	2016829	96	26/07/2016
2016	2016829	97	26/07/2016
2016	2016829	99	26/07/2016
2016	2016829	100	27/07/2016
2016	2016829	101	27/07/2016
2016	2016829	102	28/07/2016
2016	2016829	104	29/07/2016
2016	2016829	105	29/07/2016

Appendix 2

IESSNS 2007. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 85

SpecCat: MAKRELL

LenGrp	age 2	3	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	269	-	-	-	-	269	68.7	255.00
32-33	-	269	-	-	-	269	76.8	285.00
36-37	-	-	269	-	-	269	111.8	415.00
38-39	-	-	-	269	-	269	153.6	570.00
39-40	-	-	269	269	-	539	339.4	630.00
40-41	-	-	-	-	269	269	157.6	585.00
42-43	-	-	-	-	269	269	184.5	685.00
TSN(1000)	269	269	539	539	539	2155	-	-
TSB(1000 kg)	68.7	76.8	273.4	331.4	342.1	-	1092.4	-
Mean length (cm)	31.00	32.00	37.50	38.50	41.00	-	-	-
Mean weight (g)	255.00	285.00	507.50	615.00	635.00	-	-	506.88

Variable: Abundance

EstLayer: 1

Stratum: 86

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1057	-	-	-	-	1057	288.3	272.67
31-32	818	-	164	-	-	982	295.1	300.50
32-33	1586	-	-	-	-	1586	513.1	323.56
33-34	1410	-	705	-	-	2114	740.8	350.33
34-35	685	-	1883	-	-	2568	972.8	378.80

35-36	-	-	1938	705	-	2643	1143.6	432.67
36-37	-	352	2643	705	-	3700	1673.6	452.29
37-38	-	176	881	-	176	1233	650.6	527.43
38-39	-	-	352	-	176	529	290.6	549.67
39-40	-	-	-	-	1233	1233	703.2	570.14
40-41	-	-	-	176	-	176	113.3	643.00
TSN(1000)	5556	529	8567	1586	1586	17823	-	-
TSB(1000 kg)	1803.8	233.5	3713.0	735.3	899.4	-	7384.9	-
Mean length (cm)	31.97	36.33	35.18	36.00	38.67	-	-	-
Mean weight (g)	324.65	441.67	433.43	463.67	567.11	-	-	414.35

Variable: Abundance

EstLayer: 1

Stratum: 87

SpecCat: MAKRELL

	age										
LenGrp	1	2	3	4	5	6	8	14	Number	Biomass	Mean W
									(1E3)	(1E3kg)	(g)
24-25	4880	-	-	-	-	-	-	-	4880	636.0	130.33
25-26	8133	-	-	-	-	-	-	-	8133	1137.0	139.80
26-27	8133	4880	-	-	-	-	-	-	13013	2078.8	159.75
27-28	-	19520	-	-	-	-	-	-	19520	3622.5	185.58
28-29	-	20910	13442	-	-	-	-	-	34352	7252.7	211.13
29-30	-	17036	-	-	-	-	-	-	17036	4029.0	236.50
30-31	-	16367	8614	6030	-	-	-	-	31011	8026.7	258.83
31-32	-	6647	11631	2492	-	-	-	-	20770	6117.3	294.52
32-33	-	-	8988	-	3457	-	-	-	12445	3968.5	318.89
33-34	-	-	-	1544	3345	-	-	-	4889	1675.4	342.68
34-35	-	-	945	-	-	1259	-	-	2204	787.4	357.29
35-36	-	-	-	-	1246	1246	-	-	2493	1035.2	415.30
36-37	-	-	-	577	-	-	-	-	577	227.8	394.67
37-38	-	-	-	-	-	-	289	-	289	138.7	480.67
38-39	-	-	-	-	192	96	-	-	289	145.8	505.00
40-41	-	-	-	-	-	-	96	96	192	103.0	535.00
TSN(1000)	21146	85359	43620	10644	8241	2602	385	96	172092	-	-
TSB(1000 kg)	3077.6	19042.5	11602.2	3093.6	2920.3	1003.9	184.0	57.7	-	40981.8	-
Mean length (cm)	25.15	28.47	30.15	30.99	33.00	34.63	37.75	40.00	-	-	-
Mean weight (g)	145.54	223.09	265.98	290.65	354.38	385.84	478.00	600.00	-	-	238.14

Variable: Abundance

EstLayer: 1

Stratum: 88

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	48908	-	-	-	-	-	48908	4900.5	100.20
23-24	130078	-	-	-	-	-	130078	14352.0	110.33
24-25	323703	28988	-	-	-	-	352692	42951.1	121.78
25-26	360810	60135	-	-	-	-	420945	58765.3	139.60
26-27	178811	188222	-	-	-	-	367033	58650.0	159.79
27-28	75452	201206	88027	-	-	-	364685	67429.1	184.90
28-29	33496	184230	-	-	-	-	217726	46057.4	211.54
29-30	-	231776	-	57944	-	-	289720	68122.7	235.13
30-31	-	101602	50801	16934	-	-	169336	40657.6	240.10
31-32	-	-	48390	-	-	-	48390	12710.4	262.67
32-33	-	-	48671	-	-	-	48671	14674.4	301.50
33-34	-	-	-	-	236	-	236	69.7	295.00
34-35	-	-	563	-	-	-	563	170.3	302.50
35-36	-	-	-	282	-	-	282	98.5	350.00
40-41	-	-	-	-	-	282	282	147.8	525.00
TSN(1000)	1151259	996158	236453	75159	236	282	2459547	-	-
TSB(1000 kg)	154179.5	199318.4	58162.3	17879.2	69.7	147.8	-	429756.9	-
Mean length (cm)	24.74	27.56	29.51	29.25	33.00	40.00	-	-	-
Mean weight (g)	133.92	200.09	245.98	237.88	295.00	525.00	-	-	174.73

Variable: Abundance

EstLayer: 1

Stratum: 104

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	13	14	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	-	100	-	-	-	-	-	-	-	-	-	100	33.6	335.00

33-34	364	-	-	-	-	-	-	-	-	-	-	-	364	124.3	341.75
34-35	96	-	670	-	-	-	-	-	-	-	-	-	765	299.5	391.38
35-36	-	77	385	-	-	77	-	-	-	-	-	-	539	216.1	400.71
36-37	-	430	688	86	-	-	-	-	-	-	-	-	1204	549.7	456.43
37-38	-	-	88	703	88	-	-	-	-	-	-	-	878	439.9	500.90
38-39	-	-	357	89	357	-	-	-	-	-	-	-	803	433.2	539.56
39-40	-	-	753	470	376	470	-	-	-	-	-	-	2070	1157.4	559.09
40-41	-	-	-	-	-	956	1052	-	-	-	-	-	2007	1196.7	596.14
41-42	-	-	-	575	-	-	-	479	-	-	-	-	1054	634.3	601.82
42-43	-	-	-	-	-	-	-	-	401	301	-	-	703	502.3	714.86
43-44	-	-	-	-	-	-	-	201	201	-	-	-	401	298.2	742.75
45-46	-	-	-	-	-	-	-	-	-	-	201	100	301	242.3	804.67
47-48	-	-	-	-	-	-	-	-	-	-	-	100	100	88.3	880.00
TSN(1000)	459	507	3041	1923	821	1503	1052	680	602	301	201	201	11291	-	-
TSB(1000 kg)	160.2	226.5	1417.5	1031.9	461.4	894.6	603.9	439.5	433.2	216.6	155.0	175.7	-	6215.9	-
Mean length (cm)	33.21	35.85	36.31	38.69	38.35	39.43	40.00	41.59	42.33	42.00	45.00	46.00	-	-	-
Mean weight (g)	348.67	446.56	466.14	536.57	561.98	595.00	574.27	646.56	719.33	719.33	772.00	875.00	-	-	550.50

Variable: Abundance

EstLayer: 1

Stratum: 105

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	8	9	10	11	12	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	396	-	-	-	-	-	-	-	-	-	-	396	108.8	275.00
30-31	1815	2540	-	-	-	-	-	-	-	-	-	4355	1242.2	285.25
31-32	1553	1165	-	-	-	-	-	-	-	-	-	2718	851.6	313.29
32-33	-	3912	1174	1956	1956	-	-	-	-	-	-	8998	3076.2	341.87
33-34	-	9877	3039	-	-	-	-	-	-	-	-	12916	4637.8	359.09
34-35	-	4533	6974	3487	-	-	-	-	-	-	-	14995	5937.1	395.95
35-36	-	-	-	9436	1665	-	-	-	-	-	-	11102	4886.9	440.20
36-37	-	-	867	6719	650	-	-	-	-	-	-	8237	3755.3	455.92
37-38	-	-	-	5332	-	508	508	762	-	-	-	7110	3554.6	499.96
38-39	-	-	-	1048	2726	210	-	-	-	-	-	3984	2139.0	536.95
39-40	-	-	358	1433	358	358	-	-	538	179	-	3225	1856.5	575.67
40-41	-	-	-	-	556	-	-	-	-	1113	-	1669	951.9	570.17
41-42	-	-	-	871	-	-	-	-	436	-	-	1307	794.4	608.00
42-43	-	-	-	-	-	-	-	-	385	-	-	385	213.9	555.00
43-44	-	-	-	-	-	-	-	-	-	-	86	86	55.0	635.50

TSN(1000)	3764	22027	12412	30284	7912	1076	508	762	1358	1292	86	81481	-	-
TSB(1000 kg)	1112.3	7686.0	4933.2	13802.9	3660.8	629.2	254.9	395.6	790.8	740.4	55.0	-	34061.1	-
Mean length (cm)	30.31	32.58	33.85	35.73	35.91	37.86	37.00	37.00	40.49	39.86	43.00	-	-	-
Mean weight (g)	295.54	348.93	397.45	455.78	462.68	584.89	502.00	519.33	582.19	573.00	635.50	-	-	418.02

Variable: Abundance

EstLayer: 1

Stratum: 106

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	205	-	-	-	-	-	-	-	205	18.7	91.00
25-26	410	-	-	-	-	-	-	-	410	62.7	153.00
26-27	304	-	-	-	-	-	-	-	304	55.9	184.00
27-28	-	205	205	-	-	-	-	-	410	85.9	209.50
28-29	-	4657	-	-	-	-	-	-	4657	1006.6	216.15
29-30	-	10520	3214	-	-	-	-	-	13734	3274.0	238.38
30-31	-	24149	14326	-	-	-	-	-	38475	10217.1	265.55
31-32	-	14637	11104	-	2019	-	-	-	27760	7983.2	287.58
32-33	-	6764	10822	7666	3157	-	-	-	28409	8991.5	316.51
33-34	-	-	23971	-	5532	-	-	-	29503	10172.1	344.78
34-35	-	-	12539	5573	3483	-	-	-	21594	8130.6	376.52
35-36	-	-	3254	5694	2440	813	3254	-	15456	6158.7	398.47
36-37	-	-	-	2465	3944	1479	-	-	7887	3463.5	439.13
37-38	-	-	-	-	4215	2529	-	1686	8431	3718.0	441.00
38-39	-	-	-	-	-	2219	-	-	2219	1121.6	505.50
39-40	-	-	-	-	-	3215	-	-	3215	1906.3	593.00
40-41	-	-	-	-	-	-	-	3010	3010	1805.8	600.00
41-42	-	-	-	-	-	-	-	205	205	125.1	610.00
TSN(1000)	919	60932	79435	21397	24790	10255	3254	4901	205882	-	-
TSB(1000 kg)	137.3	16184.9	25759.7	7913.3	9308.5	5080.0	1330.0	2583.4	-	68297.1	-
Mean length (cm)	24.66	30.13	32.11	33.78	34.20	37.54	35.00	39.01	-	-	-
Mean weight (g)	149.42	265.62	324.29	369.83	375.50	495.37	408.75	527.13	-	-	331.73

Variable: Abundance

EstLayer: 1

Stratum: 107

SpecCat: MAKRELL

LenGrp	age 1	2	3	5	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
25-26	559	186	-	-	-	746	110.0	147.50
26-27	7738	12380	-	-	-	20118	3139.9	156.08
27-28	11140	26737	-	-	-	37878	7200.1	190.09
28-29	-	65595	-	-	-	65595	14134.2	215.48
29-30	-	75249	-	-	-	75249	18156.5	241.29
30-31	-	117762	6264	-	-	124026	33073.6	266.67
31-32	-	51073	11533	-	-	62606	17981.1	287.21
32-33	-	12628	7892	-	-	20520	6183.0	301.31
33-34	-	-	20625	-	-	20625	6614.9	320.71
34-35	-	-	621	-	-	621	201.1	323.75
35-36	-	-	3919	-	-	3919	1377.4	351.50
37-38	-	-	-	431	-	431	189.5	440.00
38-39	-	-	-	536	-	536	265.2	495.00
39-40	-	-	-	431	-	431	247.7	575.00
41-42	-	-	-	-	431	431	284.3	660.00
TSN(1000)	19437	361611	50855	1397	431	433731	-	-
TSB(1000 kg)	3533.9	89056.4	15581.5	702.4	284.3	-	109158.5	-
Mean length (cm)	26.54	29.28	32.19	38.00	41.00	-	-	-
Mean weight (g)	181.81	246.28	306.39	502.71	660.00	-	-	251.67

Variable: Abundance

EstLayer: 1

Stratum: 108

SpecCat: MAKRELL

LenGrp	age 1	2	3	5	6	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	9086	-	-	-	-	-	9086	999.4	110.00
24-25	42830	-	-	-	-	-	42830	5189.1	121.15
25-26	85680	11684	-	-	-	-	97364	13155.8	135.12
26-27	66036	-	-	-	-	-	66036	9637.7	145.95
27-28	67531	21610	-	-	-	-	89142	15640.3	175.45

28-29	26686	20015	-	-	-	-	46701	9226.7	197.57
29-30	-	19051	8335	-	-	-	27386	6091.6	222.43
30-31	-	69997	-	-	-	-	69997	18238.7	260.56
31-32	-	44565	5435	-	-	-	50000	14146.8	282.93
32-33	-	11946	2389	-	-	-	14335	4359.8	304.13
33-34	-	6887	8854	-	-	-	15741	5248.7	333.44
34-35	-	4234	3176	-	-	-	7410	2666.5	359.86
35-36	-	-	-	5014	-	-	5014	2238.7	446.50
36-37	-	-	-	-	471	-	471	191.2	406.00
39-40	-	-	-	-	4543	-	4543	2930.1	645.00
43-44	-	-	-	-	-	4543	4543	3316.2	730.00
TSN(1000)	297850	209988	28189	5014	5014	4543	550597	-	-
TSB(1000 kg)	44386.3	52077.5	8137.3	2238.7	3121.3	3316.2	-	113277.3	-
Mean length (cm)	25.74	29.64	31.46	35.00	38.72	43.00	-	-	-
Mean weight (g)	149.02	248.00	288.67	446.50	622.55	730.00	-	-	205.74

Variable: Abundance

EstLayer: 1

Stratum: 109

SpecCat: MAKRELL

	age					
LenGrp	1	2	3	Number	Biomass	Mean W
				(1E3)	(1E3kg)	(g)
23-24	100	-	-	100	11.3	112.50
24-25	2170	-	-	2170	272.8	125.68
25-26	3435	1717	-	5152	715.5	138.89
26-27	2575	-	-	2575	395.7	153.67
27-28	1370	1370	-	2741	472.0	172.22
28-29	130	908	389	1428	289.4	202.73
29-30	-	1574	-	1574	349.2	221.82
30-31	-	6298	-	6298	1669.9	265.15
31-32	-	4728	-	4728	1314.0	277.92
32-33	-	2689	633	3322	1003.6	302.14
33-34	-	308	308	616	197.1	320.00
34-35	-	-	504	504	190.0	377.00
TSN(1000)	9780	19593	1834	31207	-	-
TSB(1000 kg)	1424.4	4884.1	572.0	-	6880.4	-
Mean length (cm)	25.34	29.74	31.87	-	-	-
Mean weight (g)	145.64	249.27	311.91	-	-	220.48

Variable: Abundance

EstLayer: 1

Stratum: 123

SpecCat: MAKRELL

LenGrp	age 5	7	8	9	10	11	12	13	14	16	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	43	-	-	-	-	-	-	-	-	-	43	13.7	319.00
37-38	45	-	-	-	45	-	-	-	-	-	89	43.5	488.00
38-39	-	45	89	-	-	-	-	-	-	-	134	80.5	602.00
39-40	45	45	-	45	45	-	-	-	-	-	180	102.9	571.00
40-41	-	45	45	45	45	45	45	-	-	-	269	167.1	620.50
41-42	-	-	45	45	45	-	-	-	-	45	178	114.5	641.75
42-43	-	-	-	45	-	-	90	-	-	-	136	96.5	712.00
43-44	-	-	-	-	-	-	-	-	45	-	45	32.3	724.00
44-45	-	-	-	-	-	-	-	45	-	-	45	34.4	771.00
TSN(1000)	133	135	179	180	179	45	135	45	45	45	1118	-	-
TSB(1000 kg)	55.9	79.0	109.7	113.1	103.2	27.4	97.2	34.4	32.3	33.3	-	685.3	-
Mean length (cm)	36.71	39.00	39.25	40.50	39.25	40.00	41.34	44.00	43.00	41.00	-	-	-
Mean weight (g)	421.79	587.08	614.22	629.30	575.94	610.00	718.63	771.00	724.00	746.00	-	-	612.78

Variable: Abundance

EstLayer: 1

Stratum: 124

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	564	-	-	-	-	-	-	-	-	-	-	-	564	142.2	252.00
29-30	3386	-	-	-	-	-	-	-	-	-	-	-	3386	879.8	259.83
30-31	7901	-	-	-	-	-	-	-	-	-	-	-	7901	2177.3	275.57
31-32	-	9594	-	-	-	-	-	-	-	-	-	-	9594	2984.4	311.06
32-33	1952	4392	-	-	-	-	-	-	-	-	-	-	6345	2002.9	315.69
33-34	-	7901	-	-	-	-	-	-	-	-	-	-	7901	2915.5	369.00

34-35	-	963	1927	2890	-	-	-	-	-	-	-	-	5780	2390.6	413.58
35-36	-	-	2078	3561	890	-	-	-	-	-	-	-	6529	2845.9	435.86
36-37	-	-	-	3175	3402	-	-	-	-	-	-	-	6578	3194.5	485.66
37-38	-	-	-	2185	900	-	514	-	-	-	-	-	3599	1846.4	512.96
38-39	-	-	-	213	1493	1813	-	533	-	-	-	-	4053	2228.0	549.74
39-40	-	-	-	-	356	1067	830	1304	119	-	-	-	3675	2142.7	583.00
40-41	-	-	-	310	621	414	1552	207	207	207	-	-	3517	2117.7	602.06
41-42	-	-	-	-	-	191	669	191	-	-	-	-	1051	707.5	673.09
42-43	-	-	-	-	-	-	-	-	187	93	93	-	373	260.5	698.25
43-44	-	-	-	-	-	-	-	-	-	-	170	-	170	120.7	710.50
44-45	-	-	-	-	-	-	-	-	-	-	-	68	68	50.6	741.00
TSN(1000)	13804	22851	4004	12336	7662	3485	3565	2235	512	300	263	68	71086	-	-
TSB(1000 kg)	3825.5	7690.9	1761.4	5665.1	3888.7	2020.3	2086.8	1325.0	323.1	187.7	182.2	50.6	-	29007.3	-
Mean length (cm)	29.96	32.01	34.52	35.56	36.85	38.71	39.52	39.02	40.50	40.62	42.65	44.00	-	-	-
Mean weight (g)	277.14	336.57	439.89	459.23	507.53	579.71	585.38	592.72	631.10	625.21	692.24	741.00	-	-	408.06

Variable: Abundance

EstLayer: 1

Stratum: 125

SpecCat: MAKRELL

	age									
LenGrp	2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	5797	-	-	-	-	-	-	-	5797	1246.5	215.00
29-30	16956	-	-	-	-	-	-	-	16956	4189.3	247.08
30-31	56363	-	-	-	-	-	-	-	56363	15479.9	274.65
31-32	-	48012	-	-	-	-	-	-	48012	14794.2	308.14
32-33	-	-	-	46196	-	-	-	-	46196	15199.8	329.03
33-34	-	25942	-	-	-	-	-	-	25942	8863.8	341.68
34-35	-	-	-	35776	-	-	-	-	35776	14046.4	392.62
35-36	-	-	-	23588	-	-	-	-	23588	10097.8	428.10
36-37	-	-	4455	15593	-	-	-	-	20048	9395.6	468.67
37-38	-	-	-	17390	-	-	-	-	17390	9047.7	520.27
38-39	-	-	1193	8354	3580	2387	1193	-	16707	9128.2	546.36
39-40	-	-	872	-	3488	1744	-	872	6977	4009.9	574.75
40-41	-	-	-	-	-	-	6487	-	6487	3945.8	608.25
41-42	-	-	-	-	-	-	48	-	48	34.1	705.00
TSN(1000)	79116	73953	6520	146895	7069	4131	7729	872	326286	-	-
TSB(1000 kg)	20915.7	23658.0	3410.2	60109.0	3999.6	2293.9	4637.4	455.2	-	119479.0	-

	1	2	3	4	5	6	7	8	9	Number	Biomass
Mean length (cm)	29.64	31.70	36.77	34.33	38.49	38.42	39.70	39.00	-	-	-
Mean weight (g)	264.37	319.90	523.00	409.20	565.83	555.30	600.01	522.00	-	-	366.18

Variable: Abundance

EstLayer: 1

Stratum: 126

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	6602	-	-	-	-	-	-	-	-	6602	1183.5	179.25
27-28	-	13501	-	-	-	-	-	-	-	13501	2755.5	204.10
28-29	-	19690	3282	-	-	-	-	-	-	22972	5209.6	226.79
29-30	-	55608	-	-	-	-	-	-	-	55608	13849.9	249.06
30-31	-	91598	11170	-	-	-	-	-	-	102768	28011.0	272.57
31-32	-	36967	11674	-	-	-	-	-	-	48641	14689.7	302.00
32-33	-	5700	27073	-	-	-	-	-	-	32773	10634.1	324.48
33-34	-	-	16880	7033	5627	-	-	-	-	29540	10320.6	349.38
34-35	-	-	41983	-	10076	-	-	-	-	52059	20588.7	395.48
35-36	-	-	18956	-	29487	8425	-	-	-	56867	24863.5	437.22
36-37	-	-	-	10009	60056	-	5005	-	-	75071	34842.8	464.13
37-38	-	-	-	2568	69338	-	-	-	-	71906	36253.6	504.18
38-39	-	-	-	-	14323	22917	-	-	-	37240	19656.9	527.85
39-40	-	-	-	-	4880	14641	-	2440	-	21961	12225.1	556.67
40-41	-	-	-	-	-	9483	-	-	-	9483	5885.2	620.60
42-43	-	-	-	-	-	-	-	-	3085	3085	2107.3	683.00
TSN(1000)	6602	223063	131018	19611	193787	55465	5005	2440	3085	640077	-	-
TSB(1000 kg)	1183.5	58856.5	46647.1	8496.3	92717.9	29563.0	2209.6	1295.7	2107.3	-	243076.9	-
Mean length (cm)	26.00	29.61	32.84	35.06	36.24	38.15	36.00	39.00	42.00	-	-	-
Mean weight (g)	179.25	263.86	356.03	433.25	478.45	533.00	441.50	531.00	683.00	-	-	379.76

Variable: Abundance

EstLayer: 1

Stratum: 127

SpecCat: MAKRELL

age

LenGrp		2	3	4	5	6	7	8	9	10	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	|	907	-	-	-	-	-	-	-	-	-	907	228.1	251.50
30-31	|	2883	-	-	-	-	-	-	-	-	-	2883	786.4	272.79
31-32	|	4191	105	-	105	-	-	-	-	-	-	4401	1314.0	298.57
32-33	|	-	-	-	3660	-	-	-	-	-	-	3660	1188.4	324.73
33-34	|	-	5892	-	-	-	-	-	-	-	-	5892	2172.2	368.70
34-35	|	-	5611	935	-	-	-	-	-	-	-	6546	2595.8	396.55
35-36	|	-	552	2207	2943	-	-	-	-	-	-	5702	2497.0	437.90
36-37	|	-	-	1966	1573	786	-	-	-	-	-	4326	2102.5	486.05
37-38	|	-	-	-	5077	423	-	-	-	-	-	5500	2800.2	509.15
38-39	|	-	-	205	1434	410	410	205	205	-	-	2867	1529.2	533.36
39-40	|	-	-	-	365	1094	-	-	-	-	-	1459	837.6	574.25
40-41	|	-	-	-	-	189	377	566	-	-	-	1132	677.9	598.67
41-42	|	-	-	-	-	-	-	194	-	194	-	388	243.6	628.50
43-44	|	-	-	-	-	-	-	-	-	-	225	225	145.0	646.00
TSN(1000)	|	7981	12159	5313	15155	2902	787	965	205	194	225	45885	-	-
TSB(1000 kg)	|	2255.3	4662.0	2412.7	6822.0	1551.4	454.6	583.3	118.0	113.6	145.0	-	19117.9	-
Mean length (cm)	|	30.41	33.53	35.31	35.40	37.82	38.96	39.78	38.00	41.00	43.00	-	-	-
Mean weight (g)	|	282.58	383.42	454.07	450.14	534.62	577.63	604.62	576.00	586.00	646.00	-	-	416.64

Variable: Abundance

EstLayer: 1

Stratum: 128

SpecCat: MAKRELL

	age											
LenGrp		1	2	3	5	6	8	12	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	|	203	-	-	-	-	-	-	-	203	22.9	113.20
24-25	|	5641	-	-	-	-	-	-	-	5641	719.5	127.55
25-26	|	5144	-	-	-	-	-	-	-	5144	695.9	135.28
26-27	|	6768	-	-	-	-	-	-	-	6768	1069.1	157.95
27-28	|	6438	-	-	-	-	-	-	-	6438	1121.6	174.20
28-29	|	640	1921	640	-	-	-	-	-	3202	667.3	208.40
29-30	|	-	6611	-	-	-	-	-	-	6611	1576.4	238.44
30-31	|	-	11559	-	-	-	-	-	-	11559	3149.1	272.44
31-32	|	-	35445	-	-	-	-	-	-	35445	10471.4	295.42
32-33	|	-	20486	5691	-	-	-	-	-	26177	8409.7	321.26
33-34	|	-	7392	9098	-	-	-	-	-	16490	5902.4	357.93

34-35	-	-	8142	-	-	-	-	-	8142	3173.9	389.81
35-36	-	-	5044	-	2018	-	-	-	7061	2879.6	407.79
36-37	-	-	-	5645	-	-	-	-	5645	2669.5	472.90
37-38	-	-	-	1652	-	-	-	-	1652	834.0	504.83
38-39	-	-	-	1219	2439	-	-	-	3658	2009.0	549.17
39-40	-	-	-	2016	1512	-	-	-	3527	2103.8	596.43
40-41	-	-	-	-	41	-	-	-	41	23.6	583.00
42-43	-	-	-	-	-	41	-	-	41	30.7	758.00
43-44	-	-	-	-	-	-	41	-	41	30.7	758.00
44-45	-	-	-	-	-	-	-	456	456	357.8	784.00
TSN(1000)	24835	83415	28615	10532	6009	41	41	456	153943	-	-
TSB(1000 kg)	3761.5	24813.0	10444.9	5344.2	3135.0	30.7	30.7	357.8	-	47917.9	-
Mean length (cm)	25.62	31.06	33.33	36.96	37.26	42.00	43.00	44.00	-	-	-
Mean weight (g)	151.46	297.46	365.01	507.42	521.75	758.00	758.00	784.00	-	-	311.27

Variable: Abundance

EstLayer: 1

Stratum: 142

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	11	12	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
36-37	-	903	-	-	-	-	-	-	-	-	-	903	391.3	433.33
37-38	-	1655	-	150	-	-	-	-	-	-	-	1806	881.2	487.92
38-39	163	2443	489	-	-	-	-	-	-	-	-	3095	1673.7	540.79
39-40	-	1915	1566	-	-	-	-	-	-	-	-	3481	1951.1	560.50
40-41	-	814	163	1466	489	-	163	-	-	-	-	3095	1826.9	590.26
41-42	-	146	-	293	439	-	146	146	-	-	-	1170	732.2	625.62
42-43	-	-	-	-	-	519	346	-	692	-	-	1556	1089.5	700.00
43-44	-	-	-	-	-	-	-	-	-	184	184	368	281.7	765.00
TSN(1000)	163	7877	2218	1909	928	519	655	146	692	184	184	15475	-	-
TSB(1000 kg)	88.8	4159.1	1254.2	1120.1	578.4	334.6	407.2	86.3	517.1	140.9	140.9	-	8827.5	-
Mean length (cm)	38.00	38.07	38.85	39.92	40.47	42.00	41.28	41.00	42.00	43.00	43.00	-	-	-
Mean weight (g)	545.00	527.99	565.46	586.70	623.58	645.00	621.71	590.00	747.50	765.00	765.00	-	-	570.44

Variable: Abundance

EstLayer: 1

Stratum: 143

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	13	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	119	-	-	-	-	-	-	-	-	-	-	-	119	40.3	339.00
32-33	119	-	-	-	-	-	-	-	-	-	-	-	119	42.1	354.00
33-34	-	334	-	-	-	-	-	-	-	-	-	-	334	121.2	362.33
34-35	-	1842	-	217	-	-	-	-	-	-	-	-	2058	856.1	415.95
35-36	-	-	-	2267	-	-	-	-	-	-	-	-	2267	1004.5	443.18
36-37	-	-	108	4199	108	-	-	-	-	-	-	-	4414	2150.2	487.15
37-38	-	-	417	3127	313	417	-	-	-	-	-	-	4273	2167.0	507.15
38-39	-	-	-	805	201	1308	302	201	-	-	-	-	2817	1530.0	543.18
39-40	-	-	-	504	1108	-	-	403	-	-	-	-	2014	1172.9	582.30
40-41	-	-	-	-	-	580	193	483	-	-	-	-	1256	746.3	594.15
41-42	-	-	-	-	-	-	-	-	387	-	387	-	773	496.8	642.63
42-43	-	-	-	-	-	-	97	-	97	-	-	97	290	176.4	608.33
43-44	-	-	-	-	-	-	-	-	89	89	-	-	178	125.8	705.00
TSN(1000)	238	2176	525	11117	1729	2304	592	1087	572	89	387	97	20912	-	-
TSB(1000 kg)	82.4	884.0	243.2	5495.8	964.3	1286.6	315.1	612.8	366.7	68.7	252.9	57.0	-	10629.6	-
Mean length (cm)	31.50	33.85	36.79	36.32	38.34	38.32	39.31	39.26	41.48	43.00	41.00	42.00	-	-	-
Mean weight (g)	346.50	406.26	463.75	494.38	557.61	558.31	532.50	563.67	640.68	770.00	654.25	590.00	-	-	508.29

Variable: Abundance

EstLayer: 1

Stratum: 145

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	44	-	-	-	-	-	-	-	44	16.2	366.00
35-36	44	-	-	-	-	44	-	-	89	38.6	436.00
36-37	179	45	135	-	-	-	-	-	359	166.8	464.75
37-38	177	265	177	-	-	-	-	-	618	298.7	482.93
38-39	-	44	487	-	-	44	-	-	576	293.6	509.85
39-40	-	-	398	177	44	-	-	-	618	331.5	535.93
40-41	-	-	-	44	-	133	-	-	177	102.3	577.00

41-42	-	-	-	-	89	44	44	-	177	103.2	582.50
43-44	-	-	-	-	-	-	-	43	43	28.6	673.00
TSN(1000)	445	354	1196	221	133	266	44	43	2702	-	-
TSB(1000 kg)	202.8	170.4	614.7	117.8	74.1	143.2	27.9	28.6	-	1379.6	-
Mean length (cm)	36.00	37.00	37.96	39.20	40.33	39.00	41.00	43.00	-	-	-
Mean weight (g)	456.01	480.97	513.81	533.02	558.36	538.83	630.00	673.00	-	-	510.62

Variable: Abundance

EstLayer: 1

Stratum: 146

SpecCat: MAKRELL

	age											
LenGrp	2	3	4	5	6	7	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	4892	-	-	-	-	-	-	-	-	4892	1320.8	270.00
30-31	4892	-	-	-	-	-	-	-	-	4892	1394.2	285.00
31-32	4050	16201	-	-	-	-	-	-	-	20252	6322.6	312.20
32-33	31404	-	-	-	-	-	-	-	-	31404	11350.8	361.44
33-34	-	66214	-	-	-	-	-	-	-	66214	25544.0	385.78
34-35	-	66962	-	18749	-	-	-	-	-	85711	35495.2	414.12
35-36	-	32667	17819	124730	-	-	-	-	-	175215	76539.4	436.83
36-37	-	10146	-	101462	7610	-	-	-	-	119217	57828.0	485.06
37-38	-	-	29182	160499	-	5836	-	-	-	195517	99240.7	507.58
38-39	-	-	-	63187	-	-	-	-	-	63187	33846.0	535.65
39-40	-	-	-	18081	1507	6027	3014	-	-	28629	16484.0	575.79
40-41	-	-	-	10351	-	-	-	-	-	10351	6427.9	621.00
41-42	-	-	-	-	684	-	-	-	-	684	457.0	668.00
42-43	-	-	-	-	-	-	1319	1319	1319	3956	3018.5	763.00
43-44	-	-	-	-	-	-	-	-	6260	6260	4999.9	798.67
TSN(1000)	45238	192191	47000	497059	9801	11863	4332	1319	7579	816382	-	-
TSB(1000 kg)	15135.1	76982.5	22067.5	245247.6	4804.8	6312.1	2607.1	1035.2	6077.2	-	380269.1	-
Mean length (cm)	31.37	33.68	36.24	36.44	36.81	38.02	39.91	42.00	42.83	-	-	-
Mean weight (g)	334.56	400.55	469.52	493.40	490.25	532.07	601.79	785.00	801.86	-	-	465.80

Variable: Abundance

EstLayer: 1

Stratum: 147

SpecCat: MAKRELL

LenGrp	age 3	5	6	7	8	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	82	-	-	-	-	-	82	26.9	326.00
34-35	82	-	-	-	-	-	82	31.2	378.00
36-37	-	165	-	-	-	-	165	76.6	464.50
37-38	-	245	82	-	-	-	326	157.9	484.00
38-39	-	-	79	79	-	-	158	74.2	470.50
39-40	-	245	-	82	-	-	326	186.1	570.75
40-41	-	82	-	165	-	-	247	145.4	588.00
41-42	-	-	-	-	82	-	82	55.8	677.00
42-43	-	-	-	-	-	82	82	66.0	801.00
TSN(1000)	165	737	160	325	82	82	1552	-	-
TSB(1000 kg)	58.0	381.2	73.6	185.4	55.8	66.0	-	820.1	-
Mean length (cm)	33.50	37.78	37.49	39.26	41.00	42.00	-	-	-
Mean weight (g)	352.00	517.63	458.85	569.89	677.00	801.00	-	-	528.43

Variable: Abundance

EstLayer: 1

Stratum: 162

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	13	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	400	-	-	-	-	-	-	-	-	-	400	147.7	369.00
34-35	400	-	-	-	-	-	-	-	-	-	400	164.9	412.00
35-36	-	-	3584	-	-	-	-	-	-	-	3584	1592.3	444.29
36-37	-	902	7214	-	-	-	-	-	-	-	8116	3878.2	477.83
37-38	-	-	10640	-	-	-	-	-	-	-	10640	5506.3	517.52
38-39	-	-	13117	3279	3279	-	-	-	-	-	19676	10644.3	540.98
39-40	-	-	4396	5861	-	4884	-	-	-	-	15142	8741.2	577.29
40-41	-	-	557	10019	1670	-	-	1670	-	-	13915	8410.6	604.44
41-42	-	-	-	596	1787	3573	-	-	-	-	5955	3930.0	659.90
42-43	-	-	-	-	-	-	1705	426	-	-	2132	1451.1	680.80
43-44	-	-	-	-	-	-	-	1061	531	-	1592	1172.1	736.33
44-45	-	-	-	-	-	-	-	-	-	530	530	420.0	792.00

TSN(1000)	801	902	39508	19755	6736	8458	1705	3157	531	530	82082	-	-
TSB(1000 kg)	312.6	433.3	20580.4	11270.2	4089.3	5273.9	1152.7	2120.5	405.9	420.0	-	46058.8	-
Mean length (cm)	33.50	36.00	37.23	39.40	39.29	39.84	42.00	41.28	43.00	44.00	-	-	-
Mean weight (g)	390.50	480.50	520.91	570.51	607.10	623.56	676.00	671.61	765.00	792.00	-	-	561.13

Variable: Abundance

EstLayer: 1

Stratum: 163

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	12	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	111	-	-	-	-	-	-	-	-	111	37.9	340.00
33-34	111	-	-	-	-	-	-	-	-	111	40.0	359.00
34-35	-	111	-	-	-	-	-	-	-	111	43.6	391.00
35-36	-	-	1515	-	-	-	-	-	-	1515	676.0	446.14
36-37	-	-	3543	-	-	-	-	-	-	3543	1665.1	470.00
37-38	3724	-	4297	-	-	-	-	-	-	8022	3958.0	493.43
38-39	-	-	4219	-	-	3245	-	-	-	7464	4012.2	537.52
39-40	-	-	2852	-	356	1069	1426	-	-	5704	3332.1	584.19
40-41	-	-	-	1588	-	529	-	-	-	2117	1338.1	632.13
41-42	-	-	-	-	-	345	345	-	-	691	437.1	632.75
42-43	-	-	-	-	-	-	-	356	-	356	247.0	693.00
44-45	-	-	-	-	-	-	-	-	356	356	285.2	800.00
TSN(1000)	3947	111	16426	1588	356	5189	1771	356	356	30103	-	-
TSB(1000 kg)	1882.2	43.6	8430.1	990.9	200.7	2923.8	1069.0	247.0	285.2	-	16072.5	-
Mean length (cm)	36.72	34.00	37.20	40.00	39.00	38.61	39.39	42.00	44.00	-	-	-
Mean weight (g)	476.84	391.00	513.21	624.17	563.00	563.41	603.47	693.00	800.00	-	-	533.92

Variable: Abundance

EstLayer: 1

Stratum: 164

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	12	Number	Biomass	Mean W

										(1E3)	(1E3kg)	(g)
34-35	-	-	72	-	-	-	-	-	-	72	28.6	395.00
35-36	72	-	145	72	-	-	-	-	-	290	131.0	452.00
36-37	-	290	386	-	-	-	-	-	-	676	328.5	485.86
37-38	-	-	-	1618	-	-	-	-	-	1618	836.3	516.85
38-39	-	-	1449	241	-	-	-	-	-	1690	914.9	541.24
39-40	-	-	-	651	407	163	325	-	-	1546	898.5	581.37
40-41	-	-	-	527	-	176	-	263	-	966	599.9	621.00
41-42	-	-	-	-	-	-	319	213	-	531	354.7	667.60
42-43	-	-	-	-	-	-	-	-	72	72	51.9	717.00
TSN(1000)	72	290	2053	3110	407	338	644	476	72	7462	-	-
TSB(1000 kg)	30.9	137.0	1076.7	1693.7	237.0	203.4	400.2	313.5	51.9	-	4144.4	-
Mean length (cm)	35.00	36.00	37.27	37.96	39.00	39.52	39.99	40.45	42.00	-	-	-
Mean weight (g)	427.00	472.67	524.53	544.66	582.80	601.23	621.33	658.58	717.00	-	-	555.39

Variable: Abundance

EstLayer: 1

Stratum: 165

SpecCat: MAKRELL

	age							
LenGrp	4	5	6	7	9	Number	Biomass	Mean W
						(1E3)	(1E3kg)	(g)
34-35	26	-	-	-	-	26	10.7	414.00
35-36	-	55	-	-	-	55	24.5	447.50
36-37	26	129	-	-	-	155	72.6	467.83
37-38	-	181	-	-	-	181	89.5	494.14
38-39	-	132	-	26	-	158	81.7	516.17
39-40	-	-	-	83	55	139	80.0	577.20
40-41	-	-	29	-	-	29	18.4	634.00
41-42	-	-	-	26	-	26	16.3	629.00
TSN(1000)	52	497	29	135	55	769	-	-
TSB(1000 kg)	23.9	240.3	18.4	80.1	31.1	-	393.8	-
Mean length (cm)	35.00	36.78	40.00	39.19	39.00	-	-	-
Mean weight (g)	461.50	483.21	634.00	591.34	561.50	-	-	512.13

Variable: Abundance

EstLayer: 1

Stratum: 166

SpecCat: MAKRELL

LenGrp		age 4	5	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
36-37	|	-	322	-	-	-	322	147.0	456.50
37-38	|	322	644	161	-	-	1127	562.2	498.86
38-39	|	-	1449	-	-	-	1449	756.0	521.78
39-40	|	-	644	-	-	-	644	358.5	556.75
40-41	|	-	-	161	-	-	161	102.4	636.00
41-42	|	-	-	-	161	161	322	198.5	616.50
42-43	|	-	-	-	-	322	322	214.9	667.50
46-47	|	-	-	161	-	-	161	144.3	896.00
TSN(1000)	|	322	3059	483	161	483	4508	-	-
TSB(1000 kg)	|	149.7	1587.7	332.9	106.1	307.3	-	2483.8	-
Mean length (cm)	|	37.00	37.79	41.00	41.00	41.67	-	-	-
Mean weight (g)	|	465.00	519.05	689.33	659.00	636.33	-	-	551.00

Variable: Abundance

EstLayer: 1

Stratum: 183

SpecCat: MAKRELL

LenGrp		age 5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
39-40	|	54	-	-	-	-	-	-	54	29.7	547.00
40-41	|	-	128	-	64	-	-	-	192	112.8	586.00
41-42	|	-	-	188	-	-	-	-	188	123.0	655.00
42-43	|	-	-	-	-	61	123	-	184	131.7	714.67
43-44	|	-	-	-	-	-	67	67	134	100.9	755.50
TSN(1000)	|	54	128	188	64	61	190	67	752	-	-
TSB(1000 kg)	|	29.7	79.3	123.0	33.5	44.0	140.6	48.1	-	498.0	-
Mean length (cm)	|	39.00	40.00	41.00	40.00	42.00	42.35	43.00	-	-	-
Mean weight (g)	|	547.00	618.00	655.00	522.00	716.00	741.11	720.00	-	-	662.03

Variable: Abundance

EstLayer: 1

Stratum: 185

SpecCat: MAKRELL

LenGrp		3	5	6	7	8	9	10	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	|	27	-	-	-	-	-	-	-	-	27	7.8	288.00
35-36	|	-	28	-	-	-	-	-	-	-	28	12.5	441.00
37-38	|	-	112	-	-	-	-	-	-	-	112	53.5	478.00
38-39	|	-	140	-	-	28	-	-	-	-	169	93.3	553.67
39-40	|	-	57	-	57	-	28	-	-	-	141	86.5	611.80
40-41	|	-	-	28	-	85	-	28	-	-	141	91.1	644.00
41-42	|	-	-	113	56	28	-	28	-	-	225	149.6	664.75
42-43	|	-	-	-	-	-	57	-	28	-	85	60.2	709.67
45-46	|	-	-	-	-	-	-	-	-	28	28	23.2	819.00
TSN(1000)	|	27	337	141	113	141	85	56	28	28	957	-	-
TSB(1000 kg)	|	7.8	175.9	92.3	71.5	90.1	58.5	37.2	21.4	23.2	-	577.8	-
Mean length (cm)	|	34.00	37.58	40.80	40.00	39.80	41.00	40.50	42.00	45.00	-	-	-
Mean weight (g)	|	288.00	521.59	655.17	633.63	638.47	689.00	658.88	755.00	819.00	-	-	603.70

Variable: Abundance

EstLayer: 1

Stratum: 186

SpecCat: MAKRELL

LenGrp		5	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
39-40	|	28	28	57	29.0	513.00
40-41	|	-	28	28	17.7	624.00
TSN(1000)	|	28	57	85	-	-
TSB(1000 kg)	|	12.7	34.0	-	46.7	-
Mean length (cm)	|	39.00	39.50	-	-	-
Mean weight (g)	|	449.00	600.50	-	-	550.00

IESSNS 2010. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 62

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	482	-	482	-	-	-	-	-	965	361.6	374.80
35-36	-	-	-	482	-	-	-	-	482	242.4	502.60
36-37	-	482	965	-	-	-	-	-	1447	670.5	463.33
37-38	-	482	482	-	-	-	-	-	965	491.2	509.20
38-39	-	965	-	1447	965	482	-	-	3859	2213.8	573.70
39-40	-	1929	482	1929	482	1447	-	-	6271	3852.8	614.41
40-41	-	482	482	482	482	1447	965	-	4341	2752.0	633.91
41-42	-	-	482	-	482	-	-	482	1447	914.7	632.13
42-43	-	-	482	965	482	965	965	-	3859	2531.6	656.05
43-44	-	-	-	-	482	-	-	-	482	340.8	706.50
TSN(1000)	482	4341	3859	5306	3377	4341	1929	482	24118	-	-
TSB(1000 kg)	181.2	2531.7	2160.7	3254.4	2078.3	2583.8	1275.3	306.0	-	14371.4	-
Mean length (cm)	34.00	38.33	38.13	39.00	40.14	39.89	41.00	41.00	-	-	-
Mean weight (g)	375.60	583.17	559.94	613.35	615.51	595.18	660.97	634.40	-	-	595.88

Variable: Abundance

EstLayer: 1

Stratum: 65

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	59	59	-	-	-	-	-	118	35.4	300.00

33-34	|	59	236	118	-	-	-	-	-	413	136.0	329.29
34-35	|	-	-	59	-	59	-	-	-	118	42.2	357.50
35-36	|	-	-	-	118	53	-	-	-	171	66.7	389.83
37-38	|	-	-	59	118	-	-	-	-	177	75.5	426.67
38-39	|	-	-	-	-	-	-	59	-	59	27.1	460.00
39-40	|	-	-	-	-	-	-	-	118	118	58.4	495.00
40-41	|	-	-	-	-	-	53	-	-	53	22.8	430.00
TSN(1000)	|	59	295	295	236	112	53	59	118	1227	-	-
TSB(1000 kg)	|	18.3	98.5	98.0	100.3	40.7	22.8	27.1	58.4	-	464.3	-
Mean length (cm)	|	33.00	32.80	33.80	36.00	34.47	40.00	38.00	39.00	-	-	-
Mean weight (g)	|	310.00	334.00	332.00	425.00	363.42	430.00	460.00	495.00	-	-	378.25

Variable: Abundance

EstLayer: 1

Stratum: 66

SpecCat: MAKRELL

		age										
LenGrp		2	3	4	5	6	8	9	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	|	-	485	-	-	-	-	-	-	485	105.2	216.88
29-30	|	445	506	-	-	-	-	-	-	951	220.2	231.60
30-31	|	-	1215	121	-	-	-	-	-	1336	330.4	247.20
31-32	|	-	446	446	364	-	-	-	-	1255	338.6	269.75
32-33	|	-	61	487	-	-	-	-	-	547	160.0	292.39
33-34	|	-	-	-	-	689	-	-	-	689	222.8	323.41
34-35	|	-	-	-	466	-	-	-	-	466	158.7	340.43
35-36	|	-	-	-	121	770	-	-	-	891	327.8	367.73
36-37	|	-	-	-	-	-	689	-	-	689	266.9	387.37
37-38	|	-	-	-	-	547	-	-	-	547	224.8	410.75
38-39	|	-	-	-	-	61	243	-	-	304	135.0	444.00
39-40	|	-	-	-	-	-	162	-	81	243	115.6	475.00
40-41	|	-	-	-	-	-	-	365	-	365	189.8	520.58
41-42	|	-	-	-	-	-	81	-	-	81	46.2	570.00
43-44	|	-	-	-	81	-	-	-	-	81	51.1	630.00
TSN(1000)	|	445	2712	1054	1032	2067	1176	365	81	8932	-	-
TSB(1000 kg)	|	101.8	656.4	290.0	359.0	759.1	494.8	189.8	42.2	-	2893.2	-
Mean length (cm)	|	29.00	29.66	31.35	33.77	34.95	37.17	40.00	39.00	-	-	-
Mean weight (g)	|	228.88	242.03	275.20	347.71	367.21	420.88	520.58	520.00	-	-	323.91

Variable: Abundance

EstLayer: 1

Stratum: 69

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	10	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	-	-	-	-	-	-	110	110	10.4	94.00
24-25	331	-	-	-	-	-	-	331	36.5	110.33
25-26	-	-	-	-	-	-	850	850	124.5	146.44
26-27	-	5510	-	-	-	-	-	5510	860.5	156.17
27-28	-	13304	-	-	-	-	-	13304	2298.5	172.77
28-29	-	14926	2220	-	-	-	-	17146	3281.0	191.36
29-30	-	11636	6140	-	-	-	-	17775	3622.4	203.79
30-31	-	2960	6061	-	-	-	-	9021	2017.3	223.62
31-32	-	110	-	2960	-	-	-	3070	759.5	247.41
32-33	-	-	-	5290	3699	-	-	8989	2386.3	265.47
33-34	-	-	2960	1181	-	-	-	4141	1216.2	293.72
34-35	-	-	-	850	-	-	-	850	261.7	307.80
35-36	-	-	-	850	2330	-	-	3180	1078.8	339.24
42-43	-	-	-	-	-	740	-	740	496.5	671.00
TSN(1000)	331	48446	17380	11130	6029	740	960	85017	-	-
TSB(1000 kg)	36.5	9065.9	3928.7	2958.2	1829.4	496.5	134.9	-	18450.0	-
Mean length (cm)	24.00	27.87	29.90	32.22	33.16	42.00	24.66	-	-	-
Mean weight (g)	110.33	187.13	226.04	265.77	303.41	671.00	140.42	-	-	217.01

Variable: Abundance

EstLayer: 1

Stratum: 80

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	736	-	-	-	-	-	-	-	-	736	234.7	319.00
32-33	736	-	-	-	-	-	-	-	-	736	259.8	353.20

33-34	736	2207	6424	-	-	-	-	-	-	9366	3923.0	418.84
34-35	-	15160	736	1471	-	-	-	-	-	17367	7922.4	456.16
35-36	736	9578	14319	736	6424	-	-	-	-	31792	14752.8	464.04
36-37	-	3784	2943	7265	12848	-	-	-	-	26840	14050.4	523.49
37-38	-	106	17473	35062	25801	6424	-	6424	-	91289	51644.8	565.73
38-39	-	1471	-	20113	7371	7159	-	-	-	36115	21571.5	597.30
39-40	-	-	19271	27378	6530	1577	6424	-	-	61180	41637.9	680.58
40-41	-	-	-	736	19271	12848	12848	-	-	45702	30703.4	671.82
41-42	-	-	-	6424	12848	106	106	-	6424	25907	20011.7	772.45
42-43	-	-	-	-	6424	-	6424	-	-	12848	10843.3	844.00
45-46	-	-	-	-	-	-	-	-	106	106	82.7	780.50
TSN(1000)	2943	32307	61166	99185	97516	28114	25801	6424	6530	359985	-	-
TSB(1000 kg)	1107.8	14407.3	33970.1	60267.6	63131.3	18026.7	17707.0	4463.9	4556.8	-	217638.5	-
Mean length (cm)	32.75	34.65	36.66	37.90	38.40	38.75	40.25	37.00	41.06	-	-	-
Mean weight (g)	376.45	445.95	555.38	607.63	647.39	641.20	686.29	694.90	697.86	-	-	604.58

Variable: Abundance

EstLayer: 1

Stratum: 81

SpecCat: MAKRELL

	age												
LenGrp	3	4	5	6	7	8	9	10	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	136	-	-	-	-	-	-	-	-	-	136	44.8	330.00
32-33	136	701	136	-	-	-	-	-	-	-	972	328.8	338.20
33-34	1869	22342	8199	1230	-	-	-	-	-	-	33640	12998.0	386.38
34-35	565	11949	20108	2736	-	-	-	-	-	-	35359	14320.8	405.01
35-36	5034	11398	15027	11153	1282	167	-	-	-	-	44061	19480.7	442.13
36-37	84	219	14173	11643	294	2810	-	-	-	-	29223	13835.8	473.45
37-38	-	-	1230	10719	3663	-	-	-	-	-	15612	8373.8	536.36
38-39	-	-	3799	9996	2810	2517	1146	-	-	-	20269	11619.6	573.28
39-40	-	-	294	1869	1230	294	2517	-	-	-	6203	3588.5	578.49
40-41	-	-	-	2978	3816	1230	3747	-	-	-	11771	7632.7	648.44
41-42	-	-	-	294	1230	1146	1146	-	1146	-	4963	3299.5	664.87
42-43	-	-	-	-	-	2293	-	294	-	-	2586	1836.4	710.04
43-44	-	-	-	-	-	1146	1146	-	-	294	2586	2122.1	820.50
TSN(1000)	7823	46609	62966	52618	14325	11603	9703	294	1146	294	207381	-	-
TSB(1000 kg)	3152.2	19018.6	27320.2	26995.1	8211.1	7210.7	6336.5	200.5	831.7	204.8	-	99481.3	-
Mean length (cm)	34.34	33.74	34.88	36.56	38.31	39.29	39.98	42.00	41.00	43.00	-	-	-

Mean weight (g)	402.95	408.04	433.89	513.04	573.18	621.43	653.07	683.00	725.50	697.50	-	-	479.70

Variable: Abundance

EstLayer: 1

Stratum: 82

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	-	575	-	-	-	-	-	-	-	-	-	575	192.1	334.18
32-33	1495	1594	1388	-	-	-	-	-	-	-	-	4476	1500.7	335.26
33-34	-	1938	3356	1962	234	-	-	-	-	-	-	7490	2672.0	356.74
34-35	-	1046	6702	5420	471	60	341	-	-	-	-	14042	5583.0	397.60
35-36	-	234	5138	5988	885	234	-	-	-	-	-	12479	5305.6	425.16
36-37	-	471	1046	3597	2507	765	-	-	-	-	-	8387	3939.9	469.78
37-38	-	-	575	1518	1401	-	-	-	-	-	-	3493	1715.7	491.12
38-39	-	-	-	413	1624	352	813	-	-	-	-	3202	1645.9	513.98
39-40	-	-	-	341	180	238	60	234	118	-	-	1171	634.1	541.45
40-41	471	-	-	59	-	590	353	-	59	-	59	1592	905.2	568.70
41-42	-	-	-	341	-	-	-	240	234	-	-	815	542.7	665.95
42-43	-	-	-	-	-	-	-	60	-	59	-	119	82.3	688.96
TSN(1000)	1966	5858	18205	19641	7302	2239	1567	534	411	59	59	57841	-	-
TSB(1000 kg)	740.3	2102.0	7279.4	8509.0	3520.2	1145.5	790.1	311.9	255.7	36.3	28.8	-	24719.2	-
Mean length (cm)	33.92	33.03	34.16	35.11	36.36	37.53	37.62	40.24	40.28	42.00	40.00	-	-	-
Mean weight (g)	376.47	358.81	399.86	433.23	482.11	511.63	504.15	584.06	621.88	613.00	486.40	-	-	427.36

Variable: Abundance

EstLayer: 1

Stratum: 83

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	5012	15035	10023	-	-	-	-	-	-	-	30070	9916.1	329.77
33-34	-	5012	16363	79	-	-	-	-	-	-	21453	7715.3	359.64

34-35	79	3220	46469	42985	3170	-	-	-	-	-	95921	37172.5	387.53
35-36	-	5012	41550	38052	9795	-	-	-	-	-	94408	39607.3	419.53
36-37	-	-	207	30723	8545	9745	-	-	-	-	49220	22185.9	450.75
37-38	-	-	-	19823	22831	5145	-	-	-	-	47800	22011.1	460.49
38-39	-	5012	-	3327	157	8315	3248	-	-	-	20059	10277.7	512.37
39-40	-	-	-	3225	79	-	3248	55	55	-	6662	4007.8	601.56
40-41	-	-	-	-	3225	5012	6395	8237	-	-	22868	14083.9	615.88
41-42	-	-	-	-	-	3220	79	212	55	-	3566	1917.8	537.85
42-43	-	-	-	-	-	-	9509	-	-	-	9509	6369.7	669.83
44-45	-	-	-	-	-	-	-	-	-	55	55	38.4	694.50
TSN(1000)	5090	33290	114611	138213	47801	31437	22479	8504	110	55	401591	-	-
TSB(1000 kg)	1694.4	12125.0	44999.5	59464.5	22141.8	15358.0	14198.3	5219.8	63.8	38.4	-	175303.4	-
Mean length (cm)	32.03	33.70	34.05	35.36	36.42	37.84	40.42	40.02	40.00	44.00	-	-	-
Mean weight (g)	332.89	364.23	392.63	430.24	463.20	488.54	631.62	613.80	577.20	694.50	-	-	436.52

Variable: Abundance

EstLayer: 1

Stratum: 84

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	-	148	-	-	-	-	-	-	-	-	148	43.3	293.00
31-32	1075	1223	-	-	-	-	-	-	-	-	2298	680.8	296.28
32-33	6044	8836	1242	1073	-	-	-	-	-	-	17195	5436.3	316.16
33-34	2148	7336	17496	12030	-	-	-	-	-	-	39011	13667.9	350.36
34-35	-	5415	22935	27915	994	-	-	-	-	-	57259	22371.5	390.71
35-36	-	-	28816	24880	11710	-	-	-	-	-	65407	27889.2	426.40
36-37	-	-	3921	12200	3016	-	146	-	-	-	19283	8594.8	445.71
37-38	-	-	589	4156	20844	4271	8250	22	4271	-	42402	19719.8	465.06
38-39	-	-	146	2215	5416	9688	5201	-	-	-	22666	11572.1	510.55
39-40	-	-	-	1921	1140	12528	1855	4567	-	-	22010	12376.1	562.28
40-41	-	-	-	148	-	4127	4275	4127	8254	4127	25059	15250.2	608.58
41-42	-	-	-	-	-	4126	-	145	22	-	4294	2992.1	696.87
43-44	-	-	-	-	-	148	-	-	-	-	148	100.4	680.00
TSN(1000)	9268	22957	75146	86537	43121	34888	19726	8861	12547	4127	317179	-	-
TSB(1000 kg)	2922.5	7958.5	30272.4	35258.7	20198.0	20177.4	10206.8	5007.3	6370.0	2322.8	-	140694.4	-
Mean length (cm)	32.12	32.73	34.25	34.77	36.50	38.85	38.09	39.49	38.98	40.00	-	-	-
Mean weight (g)	315.34	346.67	402.85	407.44	468.40	578.35	517.43	565.07	507.68	562.80	-	-	443.58

Variable: Abundance

EstLayer: 1

Stratum: 85

SpecCat: MAKRELL

LenGrp		age 1	2	3	4	5	6	7	8	9	11	14	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	|	-	631	-	-	-	-	-	-	-	-	-	-	631	116.8	185.00
28-29	|	-	631	-	-	-	-	-	-	-	-	-	-	631	126.3	200.00
29-30	|	6157	-	-	-	-	-	-	-	-	-	-	-	6157	1453.9	236.13
30-31	|	-	9010	12946	-	-	-	-	-	-	-	-	-	21957	5767.7	262.69
31-32	|	-	4699	26364	5929	-	-	-	-	-	-	-	-	36992	10765.1	291.01
32-33	|	-	442	18239	39177	-	6917	-	-	-	-	-	-	64775	20609.5	318.17
33-34	|	-	69	15921	43490	27584	314	-	-	-	-	-	-	87377	29457.5	337.13
34-35	|	-	-	2036	21242	27615	22134	-	19	-	-	-	-	73046	26684.8	365.32
35-36	|	-	-	-	7130	9121	6574	7366	76	-	-	-	-	30268	11781.5	389.24
36-37	|	-	-	-	273	1057	8877	4144	383	986	-	-	-	15720	6495.8	413.22
37-38	|	-	-	-	90	134	726	271	453	1385	1563	-	-	4622	2123.0	459.30
38-39	|	-	-	-	534	-	25	529	1129	25	-	-	25	2268	1125.7	496.43
39-40	|	-	-	-	-	-	139	1193	565	2849	213	-	-	4959	2593.2	522.91
40-41	|	-	-	-	-	-	-	1660	-	-	-	289	-	1949	1087.3	557.98
41-42	|	-	-	-	1295	-	-	-	112	-	-	-	-	1408	776.3	551.53
42-43	|	-	-	-	-	-	-	-	245	-	-	-	-	245	155.0	633.65
TSN(1000)	|	6157	15483	75506	119159	65512	45707	15164	2982	5245	1776	289	25	353004	-	-
TSB(1000 kg)	|	1453.9	4043.4	23109.2	40367.9	23439.1	17254.3	6431.7	1504.3	2513.2	831.8	159.1	11.8	-	121119.5	-
Mean length (cm)	|	29.00	30.17	31.57	32.99	33.76	34.29	36.28	38.12	37.90	37.24	40.00	38.00	-	-	-
Mean weight (g)	|	236.13	261.15	306.06	338.77	357.79	377.50	424.16	504.44	479.15	468.28	551.55	463.00	-	-	343.11

Variable: Abundance

EstLayer: 1

Stratum: 86

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)

28-29	6681	-	-	-	-	-	-	-	-	-	6681	1286.7	192.58
29-30	17530	3445	-	-	-	-	-	-	-	-	20974	4691.5	223.68
30-31	32783	8110	-	-	-	-	-	-	-	-	40894	9951.2	243.34
31-32	10334	49618	-	-	-	-	-	-	-	-	59952	16248.9	271.03
32-33	-	-	147291	-	-	-	-	-	-	-	147291	44530.1	302.33
33-34	-	28336	74484	3276	43752	-	-	-	-	-	149847	48549.1	323.99
34-35	-	-	93834	50703	-	-	-	-	-	-	144537	50581.5	349.96
35-36	-	-	23329	42701	31023	16184	-	-	-	-	113236	42913.1	378.97
36-37	-	-	-	-	54362	2569	-	-	1541	-	58472	23769.1	406.50
37-38	-	-	-	-	9342	-	8329	-	2055	-	19725	8597.8	435.87
38-39	-	-	-	-	13779	9061	8547	-	-	3237	34623	15696.9	453.36
39-40	-	-	-	1221	1221	5887	-	-	-	-	8329	4298.8	516.15
40-41	-	-	-	-	-	-	13019	-	-	-	13019	7021.5	539.32
41-42	-	-	1221	-	-	-	-	-	-	-	1221	677.6	555.00
42-43	-	-	-	-	-	-	-	1221	-	-	1221	787.5	645.00
TSN(1000)	67328	89508	340159	97901	153478	33700	29895	1221	3597	3237	820024	-	-
TSB(1000 kg)	15809.7	25640.0	110867.4	35252.4	59273.0	14355.6	14648.6	787.5	1510.6	1456.5	-	279601.3	-
Mean length (cm)	29.69	31.47	33.01	34.47	35.21	36.58	38.59	42.00	36.57	38.00	-	-	-
Mean weight (g)	234.81	286.45	325.93	360.08	386.20	425.98	490.01	645.00	420.00	450.00	-	-	340.97

Variable: Abundance

EstLayer: 1

Stratum: 87

SpecCat: MAKRELL

	age								
LenGrp	2	3	4	5	6	9	Number	Biomass	Mean W
							(1E3)	(1E3kg)	(g)
27-28	45053	-	-	-	-	-	45053	8265.3	183.46
28-29	143246	-	-	-	-	-	143246	27872.2	194.58
29-30	98023	47177	1497	-	-	-	146697	32420.9	221.01
30-31	93131	127416	8969	-	-	-	229516	54232.6	236.29
31-32	-	156172	6885	-	-	-	163058	41553.2	254.84
32-33	-	-	99500	85108	-	-	184609	53652.7	290.63
33-34	-	7422	101711	25191	4558	-	138882	44838.6	322.85
34-35	-	-	44080	43699	-	-	87779	29153.1	332.12
35-36	-	-	-	4248	42291	-	46539	17676.7	379.82
36-37	-	-	-	-	23310	-	23310	9489.0	407.07
37-38	-	-	-	466	10065	-	10531	4604.6	437.25
39-40	-	-	-	-	-	542	542	230.2	425.00

40-41	-	-	-	-	-	854	854	640.3	750.00
TSN(1000)	379452	338188	262642	158712	80225	1395	1220615	-	-
TSB(1000 kg)	79699.3	82237.4	81088.8	49234.0	31499.2	870.5	-	324629.3	-
Mean length (cm)	28.63	30.39	32.61	32.80	35.43	39.61	-	-	-
Mean weight (g)	210.04	243.17	308.74	310.21	392.64	623.84	-	-	265.96

Variable: Abundance

EstLayer: 1

Stratum: 88

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
25-26	-	-	-	-	-	-	-	-	26002	26002	3760.2	144.61
26-27	205503	-	-	-	-	-	-	-	-	205503	35640.7	173.43
27-28	875945	-	-	-	-	-	-	-	-	875945	156488.7	178.65
28-29	629200	102729	-	-	-	-	-	-	-	731929	145844.1	199.26
29-30	577887	1785	-	-	-	-	-	-	-	579672	123097.2	212.36
30-31	134618	-	29042	-	-	-	-	-	-	163660	38371.1	234.46
31-32	281	4801	26693	-	-	-	-	-	-	31775	8177.0	257.34
32-33	-	3031	672	-	-	-	-	-	-	3702	1056.7	285.41
33-34	-	-	6718	-	-	-	-	-	-	6718	2098.5	312.34
34-35	-	2124	3421	1833	-	-	-	-	-	7378	2435.2	330.09
35-36	-	-	1564	2058	-	-	-	-	-	3622	1423.4	392.94
36-37	-	-	-	141	611	-	-	-	-	752	326.7	434.56
37-38	-	-	-	-	611	916	-	-	-	1527	658.6	431.20
38-39	-	-	-	-	-	-	305	-	-	305	164.0	537.00
39-40	-	-	-	-	-	305	-	305	-	611	334.5	547.50
40-41	-	-	-	-	-	-	-	531	-	531	344.6	649.00
TSN(1000)	2423434	114469	68110	4032	1222	1222	305	836	26002	2639634	-	-
TSB(1000 kg)	471696.4	23343.0	18115.8	1528.1	542.5	546.2	164.0	524.8	3760.2	-	520221.2	-
Mean length (cm)	27.82	28.36	31.02	34.58	36.50	37.50	38.00	39.63	25.00	-	-	-
Mean weight (g)	194.64	203.92	265.98	379.00	444.00	447.00	537.00	627.45	144.61	-	-	197.08

Variable: Abundance

EstLayer: 1

Stratum: 99

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	-	-	-	-	391	-	-	-	-	-	391	157.4	403.00
34-35	-	473	947	-	-	-	-	-	-	-	1420	557.0	392.13
35-36	391	473	2119	-	473	-	-	-	-	-	3456	1591.7	460.52
36-37	-	391	2758	2509	391	391	-	-	-	-	6439	3241.8	503.46
37-38	-	-	3847	3066	1338	-	-	-	-	-	8250	4530.0	549.09
38-39	-	-	2592	3373	2900	781	-	-	473	-	10120	5860.8	579.12
39-40	-	-	391	1338	2119	1172	-	-	-	-	5019	3268.2	651.21
40-41	-	-	-	1338	1420	473	1172	473	391	-	5267	3618.2	686.92
41-42	-	-	-	-	-	947	-	-	-	473	1420	981.5	691.00
42-43	-	-	-	-	-	-	-	473	-	-	473	378.8	800.00
44-45	-	-	-	-	-	-	-	473	-	-	473	409.3	864.50
TSN(1000)	391	1338	12653	11623	9031	3764	1172	1420	864	473	42730	-	-
TSB(1000 kg)	178.8	587.3	6622.5	6688.9	5369.9	2306.1	845.1	1103.4	550.9	341.8	-	24594.8	-
Mean length (cm)	35.00	34.94	36.49	37.65	37.94	39.11	40.00	42.00	38.90	41.00	-	-	-
Mean weight (g)	457.80	439.08	523.38	575.47	594.59	612.66	721.17	776.83	637.60	722.00	-	-	575.59

Variable: Abundance

EstLayer: 1

Stratum: 100

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	37	-	-	-	-	-	-	-	-	-	-	37	3.9	104.60
31-32	-	1565	-	-	-	-	-	-	-	-	-	1565	532.8	340.40
32-33	-	3031	6329	4131	500	-	-	-	-	-	-	13991	4879.0	348.71
33-34	109	3291	11340	11340	1565	-	-	-	-	-	-	27646	10292.1	372.28
34-35	-	4867	22219	14567	4372	367	-	-	-	-	-	46393	18332.1	395.15
35-36	-	2526	16004	14147	5027	2817	-	-	-	-	-	40522	17476.2	431.28
36-37	-	-	4354	23356	6843	1352	2364	500	-	-	-	38769	18011.7	464.59
37-38	64	-	1172	7480	14313	7289	4918	638	-	-	-	35874	18559.4	517.35
38-39	-	-	852	5025	9928	9182	4107	-	-	-	-	29094	16163.2	555.55
39-40	-	-	64	981	6262	8965	3590	1907	97	1219	-	23086	13475.5	583.72

40-41	-	-	-	367	4733	4932	6316	3254	1565	1252	-	22420	14451.9	644.60
41-42	-	-	-	1173	4731	5925	2252	367	367	-	-	14816	10282.2	694.01
42-43	-	-	-	-	614	1173	1276	-	-	-	64	3127	2358.2	754.08
43-44	-	-	-	-	-	-	-	712	367	-	-	1079	802.3	743.79
44-45	-	-	-	-	-	614	-	-	-	-	-	614	512.4	834.00
TSN(1000)	210	15281	62334	82568	58890	42617	24823	7378	2396	2471	64	299033	-	-
TSB(1000 kg)	69.1	5625.5	25114.1	36473.8	31134.9	25356.1	14693.5	4532.2	1615.5	1476.8	41.6	-	146132.9	-
Mean length (cm)	33.32	33.25	34.13	35.20	37.34	38.59	38.74	39.55	40.57	39.51	42.00	-	-	-
Mean weight (g)	328.23	368.14	402.89	441.74	528.70	594.97	591.94	614.29	674.15	597.65	651.50	-	-	488.69

Variable: Abundance

EstLayer: 1

Stratum: 103

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	44	-	3871	-	-	-	-	-	-	-	3915	1230.6	314.33
33-34	7743	3871	8060	-	178	-	-	-	-	-	-	19852	6875.7	346.35
34-35	-	3915	12979	791	159	-	-	-	-	-	-	17844	6699.4	375.44
35-36	-	-	13826	17374	12857	748	3871	-	-	-	-	48676	20538.4	421.94
36-37	-	3871	1389	6071	33999	576	3871	417	-	-	-	50195	22593.5	450.12
37-38	-	-	44	8718	9581	1053	1287	595	-	-	-	21277	9796.4	460.42
38-39	-	-	-	533	2212	8490	779	691	178	-	3871	16754	8355.6	498.73
39-40	-	-	159	4563	4466	2315	4208	748	178	3871	-	20507	11653.2	568.25
40-41	-	-	-	-	246	178	4821	374	374	-	-	5993	3104.6	518.06
41-42	-	-	-	-	178	4227	7786	374	3915	44	-	16523	10590.0	640.93
42-43	-	-	-	3871	159	-	748	44	3915	-	-	8736	5632.8	644.76
43-44	-	-	-	-	-	-	337	-	-	-	-	337	247.7	736.14
TSN(1000)	7743	11701	36457	45791	64034	17586	27707	3243	8559	3915	3871	230608	-	-
TSB(1000 kg)	2664.2	4720.7	13964.9	21042.1	29157.7	9314.4	15361.1	1738.0	5161.4	2388.5	1804.8	-	107317.9	-
Mean length (cm)	33.00	34.32	34.26	36.27	36.26	38.62	38.77	38.42	41.31	39.02	38.00	-	-	-
Mean weight (g)	344.10	403.44	383.05	459.52	455.35	529.64	554.40	535.97	603.04	610.11	466.20	-	-	465.37

Variable: Abundance

EstLayer: 1

Stratum: 104

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	-	2425	1990	-	-	-	-	-	-	-	-	-	4415	1217.0	275.63
32-33	877	12029	6682	2293	-	-	-	-	-	-	-	-	21881	6967.2	318.42
33-34	1044	6375	36858	4359	-	-	-	-	-	-	-	-	48635	16713.5	343.65
34-35	-	3698	34858	23934	491	1097	-	491	-	-	-	-	64568	24459.5	378.82
35-36	122	873	11010	13197	8633	12106	1299	638	-	-	-	-	47879	20026.9	418.28
36-37	-	-	5819	6674	10982	4978	2006	551	-	-	-	-	31009	13754.4	443.56
37-38	-	-	4231	9029	10736	4474	7165	134	-	82	-	-	35852	17445.1	486.59
38-39	-	-	-	2780	4722	3822	2823	1547	959	-	-	-	16652	8591.5	515.93
39-40	-	-	-	1876	3504	3663	3842	231	532	-	-	-	13647	7771.2	569.45
40-41	-	-	-	-	2214	3306	-	1053	1363	-	1260	-	9196	5487.2	596.70
41-42	-	-	-	-	501	1332	73	1065	1321	-	-	-	4292	2746.9	640.06
42-43	-	-	-	1230	86	-	1005	-	1349	86	-	-	3756	2542.5	676.96
43-44	-	-	-	-	-	-	1495	-	-	-	86	86	1667	1190.7	714.30
45-46	-	-	-	-	-	-	-	-	-	-	681	-	681	572.4	840.00
TSN(1000)	2042	25400	101447	65371	41868	34779	19707	5709	5524	169	2028	86	304131	-	-
TSB(1000 kg)	619.7	8506.0	37651.4	27500.1	20027.1	16902.0	10448.7	2927.3	3337.5	94.8	1408.9	62.4	-	129486.0	-
Mean length (cm)	32.69	32.55	33.79	35.15	36.79	36.83	38.02	38.07	40.28	39.55	41.81	43.00	-	-	-
Mean weight (g)	303.48	334.88	371.14	420.68	478.34	485.98	530.19	512.73	604.23	562.05	694.85	724.50	-	-	425.76

Variable: Abundance

EstLayer: 1

Stratum: 105

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	50	3929	19840	-	-	-	-	-	-	23820	6932.4	291.04
32-33	-	-	55084	-	-	-	-	-	-	55084	17037.9	309.31
33-34	-	39695	106618	16714	38370	-	-	-	-	201398	65801.7	326.73
34-35	-	12347	95209	64086	47502	29453	-	4116	-	252712	92942.6	367.78
35-36	-	-	17969	23050	91026	45513	-	-	-	177558	70825.7	398.89
36-37	-	-	3991	45575	49155	3940	46992	-	-	149653	64107.6	428.38
37-38	-	-	12533	10703	15542	-	-	-	-	38778	17106.1	441.13

38-39	-	-	-	-	14357	23645	-	-	-	38001	19336.0	508.82
39-40	-	-	-	-	7796	-	-	3232	-	11028	5555.3	503.74
40-41	-	-	-	-	-	-	-	-	7811	7811	4530.0	579.98
41-42	-	-	-	-	-	7719	-	-	-	7719	5094.7	660.00
TSN(1000)	50	55971	311244	160128	263748	110270	46992	7348	7811	963561	-	-
TSB(1000 kg)	14.6	17683.5	108530.5	61829.1	104522.1	48069.7	20958.4	3132.2	4530.0	-	369270.0	-
Mean length (cm)	31.00	33.08	33.32	34.81	35.11	35.83	36.00	36.20	40.00	-	-	-
Mean weight (g)	288.80	315.94	348.70	386.12	396.30	435.93	446.00	426.29	579.98	-	-	383.23

Variable: Abundance

EstLayer: 1

Stratum: 106

SpecCat: MAKRELL

	age										
LenGrp	2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	9035	-	-	-	-	-	-	-	9035	1872.6	207.26
29-30	27654	-	-	-	-	-	-	-	27654	6341.5	229.32
30-31	21852	34082	-	-	-	-	-	-	55934	14135.9	252.72
31-32	5831	35247	24854	-	-	-	-	-	65932	18385.2	278.85
32-33	-	16610	58559	55432	-	-	-	-	130601	39145.5	299.73
33-34	-	19298	84255	36766	12817	-	-	-	153136	49386.3	322.50
34-35	-	-	33608	94369	25827	-	-	-	153805	54689.2	355.57
35-36	-	-	20512	14634	21679	28101	-	-	84925	32438.5	381.96
36-37	-	-	-	25008	23905	-	-	-	48912	19838.1	405.58
37-38	-	-	-	-	10774	-	-	-	10774	4767.7	442.51
38-39	-	-	-	-	-	-	2274	7623	9897	4328.5	437.34
39-40	-	-	-	-	-	7594	-	-	7594	3646.2	480.15
40-41	-	-	-	-	-	-	-	4395	4395	2520.2	573.48
42-43	-	-	-	-	-	-	-	1166	1166	793.0	680.00
TSN(1000)	64372	105236	221789	226209	95001	35695	2274	13184	763760	-	-
TSB(1000 kg)	15196.0	29571.9	71361.5	77941.6	36108.8	14466.8	977.9	6663.7	-	252288.2	-
Mean length (cm)	29.38	31.20	32.85	33.63	34.94	35.85	38.00	39.02	-	-	-
Mean weight (g)	236.07	281.00	321.75	344.56	380.09	405.29	430.00	505.45	-	-	330.32

Variable: Abundance

EstLayer: 1

Stratum: 107

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	1428	-	570	-	-	-	-	-	-	1997	426.1	213.30
28-29	5491	-	-	-	-	-	-	-	-	5491	1146.0	208.71
29-30	48026	-	-	-	-	-	-	-	-	48026	11201.8	233.25
30-31	52308	26276	-	-	-	-	-	-	-	78584	19638.1	249.90
31-32	-	20589	26728	-	-	-	-	-	-	47317	12806.1	270.64
32-33	1314	39542	14619	-	-	-	-	-	-	55475	16798.8	302.82
33-34	-	2319	50613	12226	-	-	-	-	-	65158	20774.8	318.83
34-35	-	5422	38881	21249	8272	-	-	-	-	73824	25701.3	348.14
35-36	-	-	663	37183	4657	-	-	-	-	42503	15603.8	367.12
36-37	-	-	1349	4515	-	-	14706	-	-	20570	8646.0	420.32
37-38	-	-	-	337	675	7149	2877	-	-	11038	5217.1	472.66
38-39	-	-	-	-	3327	-	649	-	-	3975	2129.1	535.59
40-41	-	-	-	-	-	-	-	2829	664	3493	1882.2	538.80
41-42	-	-	-	-	-	-	-	-	2922	2922	1694.6	580.00
TSN(1000)	108566	94148	133423	75510	16931	7149	18232	2829	3586	460374	-	-
TSB(1000 kg)	25931.4	26944.9	41905.6	27312.6	6714.9	3510.3	7769.2	1513.6	2063.2	-	143665.7	-
Mean length (cm)	29.44	31.36	32.80	34.46	35.18	37.00	36.23	40.00	40.81	-	-	-
Mean weight (g)	238.85	286.20	314.08	361.71	396.59	491.04	426.14	535.00	575.37	-	-	312.06

Variable: Abundance

EstLayer: 1

Stratum: 108

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	284	-	-	-	-	-	-	284	39.8	140.00
27-28	3573	-	-	-	-	-	-	3573	663.1	185.62
28-29	18197	4174	-	-	-	-	-	22371	4649.4	207.84
29-30	50489	2496	-	-	-	-	-	52985	11782.0	222.36
30-31	24391	2199	12396	-	-	-	-	38986	9397.3	241.04
31-32	4932	14776	520	-	-	-	-	20227	5558.1	274.78

32-33	726	21763	18687	-	-	-	-	41176	12376.0	300.57
33-34	45374	-	-	-	-	-	-	45374	14631.2	322.46
34-35	-	-	18411	30042	-	-	-	48453	16771.4	346.14
35-36	-	-	6349	16622	-	-	-	22972	9032.4	393.20
36-37	-	-	518	4920	245	-	-	5684	2293.9	403.54
37-38	-	-	-	3054	2302	2302	-	7657	3583.7	468.02
38-39	-	-	-	-	-	284	-	284	167.8	590.00
39-40	-	-	-	-	-	4799	-	4799	2593.8	540.49
40-41	-	-	-	-	2257	-	-	2257	1419.9	629.00
41-42	-	-	-	-	-	-	2257	2257	1288.9	571.00
TSN(1000)	147966	45408	56881	54638	4804	7385	2257	319340	-	-
TSB(1000 kg)	37837.6	12639.3	17498.3	20568.9	2595.4	3820.4	1288.9	-	96248.8	-
Mean length (cm)	30.30	31.05	32.57	34.65	38.36	38.34	41.00	-	-	-
Mean weight (g)	255.72	278.35	307.63	376.45	540.20	517.31	571.00	-	-	301.40

Variable: Abundance

EstLayer: 1

Stratum: 119

SpecCat: MAKRELL

LenGrp	age 8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
39-40	-	94	94	55.2	585.00
41-42	-	78	78	43.6	560.00
42-43	-	94	94	60.1	637.00
43-44	94	-	94	66.2	701.50
TSN(1000)	94	267	361	-	-
TSB(1000 kg)	66.2	158.9	-	225.0	-
Mean length (cm)	43.00	40.65	-	-	-
Mean weight (g)	701.50	596.09	-	-	623.65

Variable: Abundance

EstLayer: 1

Stratum: 120

SpecCat: MAKRELL

LenGrp	age 6	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
36-37	39	78	-	118	46.7	396.70
40-41	-	-	39	39	21.3	542.60
TSN(1000)	39	78	39	157	-	-
TSB(1000 kg)	15.2	31.4	21.3	-	67.9	-
Mean length (cm)	36.00	36.00	40.00	-	-	-
Mean weight (g)	388.20	400.95	542.60	-	-	433.17

Variable: Abundance

EstLayer: 1

Stratum: 121

SpecCat: MAKRELL

LenGrp	age 2	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	124	-	-	-	-	-	-	-	-	-	124	45.1	363.00
33-34	124	-	53	-	-	-	-	-	-	-	-	177	58.1	327.80
34-35	-	550	354	91	-	-	-	-	-	-	-	996	366.4	368.01
35-36	-	556	427	39	124	-	-	-	-	-	-	1146	442.2	385.92
36-37	-	548	649	667	479	39	39	-	-	-	-	2420	1057.7	437.04
37-38	-	91	696	686	409	426	-	-	-	-	-	2309	1082.1	468.73
38-39	-	-	130	1299	788	456	177	371	-	-	-	3221	1577.3	489.75
39-40	-	-	619	953	990	969	866	636	318	-	-	5350	2745.7	513.19
40-41	-	-	-	41	586	1890	657	994	41	-	-	4209	2377.6	564.87
41-42	-	-	-	183	1520	409	399	124	41	41	-	2716	1691.5	622.72
42-43	-	-	-	-	79	-	636	318	358	318	-	1709	1112.2	650.90
43-44	-	-	-	-	-	-	358	318	318	-	-	994	674.0	678.17
44-45	-	-	-	-	-	-	358	249	-	442	-	1049	776.4	740.19
45-46	-	-	-	-	-	-	-	-	-	318	318	636	497.3	782.50
TSN(1000)	124	1869	2929	3959	4975	4189	3490	3008	1075	1118	318	27055	-	-
TSB(1000 kg)	40.1	738.5	1334.5	1883.4	2659.0	2295.4	2076.3	1761.1	678.2	791.6	245.6	-	14503.8	-
Mean length (cm)	33.00	34.90	36.52	37.77	39.07	39.31	40.80	40.44	41.30	43.61	45.00	-	-	-
Mean weight (g)	322.70	395.10	455.54	475.70	534.48	548.00	594.94	585.38	630.79	707.92	773.00	-	-	536.08

Variable: Abundance

EstLayer: 1

Stratum: 122

SpecCat: MAKRELL

LenGrp		age 3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	|	256	-	-	-	-	-	-	-	-	-	256	85.9	336.29
33-34	|	258	1023	379	189	-	73	-	-	-	-	1921	641.6	333.94
34-35	|	-	1265	1424	447	-	-	-	-	-	-	3136	1159.0	369.55
35-36	|	166	461	2040	399	128	-	-	-	-	-	3194	1290.4	403.97
36-37	|	-	422	2891	687	250	248	-	-	-	-	4499	1874.6	416.70
37-38	|	28	166	284	1020	911	284	-	-	-	-	2694	1262.5	468.70
38-39	|	-	176	584	685	515	289	77	-	176	-	2502	1244.3	497.40
39-40	|	-	-	89	571	89	261	95	-	-	-	1106	584.4	528.44
40-41	|	-	-	280	361	280	207	43	167	78	-	1415	762.0	538.57
41-42	|	-	-	-	37	-	-	-	-	-	-	37	23.1	618.50
42-43	|	-	155	-	-	-	-	-	-	-	137	292	200.9	686.96
43-44	|	-	-	85	-	-	-	-	-	-	-	85	53.3	630.40
TSN(1000)	|	708	3668	8055	4396	2173	1363	215	167	254	137	21136	-	-
TSB(1000 kg)	|	240.7	1445.9	3336.9	2035.8	1045.7	655.7	108.7	88.1	134.3	90.2	-	9182.0	-
Mean length (cm)	|	33.27	34.74	35.68	36.88	37.47	37.65	38.84	40.00	38.61	42.00	-	-	-
Mean weight (g)	|	340.11	394.22	414.25	463.06	481.18	481.06	504.67	528.22	529.12	658.00	-	-	434.42

Variable: Abundance

EstLayer: 1

Stratum: 123

SpecCat: MAKRELL

LenGrp		age 2	3	4	5	6	7	8	9	10	11	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	|	124	-	-	-	-	-	-	-	-	-	-	-	124	29.2	236.00
31-32	|	-	124	-	-	-	-	-	-	-	-	-	-	124	39.8	322.00
32-33	|	-	1256	980	-	-	-	-	-	-	-	-	-	2236	691.2	309.12
33-34	|	937	3286	2561	2585	30	-	-	-	-	-	-	-	9398	3095.7	329.39
34-35	|	-	3361	5591	9895	1334	528	-	-	-	-	-	-	20709	7547.8	364.47
35-36	|	-	51	8544	8932	4263	51	-	1532	-	-	-	-	23372	9101.4	389.41

36-37	-	-	1970	6980	7696	886	27	-	-	-	-	-	17559	7322.4	417.01
37-38	-	-	1030	4135	6053	6703	669	544	31	-	-	-	19164	8829.6	460.75
38-39	-	-	-	1504	2950	3649	2489	28	-	-	-	-	10620	5347.0	503.49
39-40	-	-	-	431	570	720	363	5024	41	-	-	-	7149	3737.0	522.69
40-41	-	-	-	-	54	1961	200	1671	-	-	-	-	3886	2227.9	573.27
41-42	-	-	-	-	457	147	1284	-	-	-	-	-	1888	1177.4	623.70
42-43	-	-	-	-	-	-	-	-	-	848	-	-	848	545.3	643.00
43-44	-	-	-	-	-	-	-	-	-	-	565	-	565	382.8	677.00
46-47	-	-	-	-	-	-	-	-	-	-	-	366	366	161.9	442.60
TSN(1000)	1061	8078	20675	34461	23406	14645	5033	8799	72	848	565	366	118008	-	-
TSB(1000 kg)	345.7	2662.6	7849.3	13831.3	10291.8	7082.5	2595.7	4451.9	35.7	545.3	382.8	161.9	-	50236.4	-
Mean length (cm)	32.53	33.24	34.53	35.19	36.39	37.61	38.77	38.37	38.15	42.00	43.00	46.00	-	-	-
Mean weight (g)	325.97	329.62	379.64	401.36	439.71	483.60	515.74	505.95	495.86	643.00	677.00	442.60	-	-	425.70

Variable: Abundance

EstLayer: 1

Stratum: 124

SpecCat: MAKRELL

	age												
LenGrp	1	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	-	20	-	-	-	-	-	-	-	-	20	4.7	239.00
30-31	1270	1372	-	-	-	-	-	-	-	-	2641	715.3	270.81
31-32	845	1041	2570	103	-	-	-	-	-	-	4559	1411.5	309.62
32-33	-	368	6734	452	162	-	-	-	-	-	7716	2430.5	315.01
33-34	-	229	3534	22364	3342	-	-	-	-	-	29469	9882.4	335.34
34-35	-	121	1009	30024	10445	61	-	-	-	-	41661	15200.2	364.86
35-36	-	85	1043	8589	19555	4286	1219	-	-	-	34778	13933.8	400.65
36-37	-	-	-	1996	14859	4152	1473	144	-	-	22625	9837.3	434.79
37-38	-	-	-	2888	5218	4438	1568	358	-	-	14470	7009.7	484.43
38-39	-	-	-	-	318	3203	1712	4507	169	-	9908	5005.9	505.23
39-40	-	-	126	-	3344	1672	1855	-	234	-	7232	4199.9	580.74
40-41	-	-	-	-	-	-	-	-	-	877	877	378.3	431.57
41-42	-	-	-	184	-	-	-	127	-	-	310	177.0	570.69
TSN(1000)	2115	3237	15016	66600	57242	17813	7827	5135	403	877	176266	-	-
TSB(1000 kg)	627.1	969.9	4988.8	24268.7	23890.8	8340.6	3878.3	2657.7	186.4	378.3	-	70186.7	-
Mean length (cm)	30.40	31.04	32.47	33.98	35.38	36.64	37.19	37.95	38.58	40.00	-	-	-
Mean weight (g)	296.55	299.61	332.23	364.39	417.36	468.22	495.49	517.52	462.70	431.57	-	-	398.19

Variable: Abundance

EstLayer: 1

Stratum: 125

SpecCat: MAKRELL

LenGrp		age 1	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	|	-	-	9209	-	-	-	-	-	-	-	9209	2048.2	222.42
30-31	|	1820	6152	-	269	-	-	-	-	-	-	8241	2175.5	264.00
31-32	|	-	21423	2128	1027	-	-	-	-	-	-	24578	6967.9	283.50
32-33	|	-	-	16045	15061	175	-	-	-	-	-	31281	9587.2	306.49
33-34	|	-	-	28563	25583	3671	383	-	-	-	-	58199	19544.1	335.81
34-35	|	-	-	1763	28061	5199	49	-	-	-	-	35072	12423.6	354.23
35-36	|	-	-	-	15121	5020	6214	23	-	-	-	26379	10199.6	386.66
36-37	|	-	-	23	5033	2258	390	-	5034	-	-	12739	5338.7	419.09
37-38	|	-	-	-	-	206	7356	-	-	-	-	7562	3438.7	454.74
38-39	|	-	-	-	-	-	-	-	594	-	-	594	338.5	569.77
39-40	|	-	-	-	-	-	-	-	-	-	1138	1138	538.5	473.00
40-41	|	-	-	-	-	-	-	-	-	2400	28	2428	1444.7	594.93
41-42	|	-	-	-	-	-	-	-	-	-	569	569	291.4	512.00
TSN(1000)	|	1820	27575	57731	90154	16529	14392	23	5628	2400	1736	217989	-	-
TSB(1000 kg)	|	464.2	7649.0	17497.9	31688.0	6218.3	6138.5	10.9	2395.3	1427.4	847.2	-	74336.5	-
Mean length (cm)	|	30.00	30.78	32.04	33.62	34.37	35.99	35.00	36.21	40.00	39.67	-	-	-
Mean weight (g)	|	255.06	277.38	303.10	351.49	376.20	426.53	466.00	425.57	594.75	488.03	-	-	341.01

Variable: Abundance

EstLayer: 1

Stratum: 126

SpecCat: MAKRELL

LenGrp		age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	|	7199	863	-	-	-	-	-	-	-	-	8062	1668.3	206.94
29-30	|	12032	5259	-	-	-	-	-	-	-	-	17290	4011.7	232.02
30-31	|	43950	4847	-	-	-	-	-	-	-	-	48798	12265.1	251.35

31-32	7999	15138	-	-	2208	-	-	-	-	-	25344	6727.7	265.45
32-33	-	24395	12642	2944	-	-	-	-	-	-	39980	11770.8	294.42
33-34	-	9361	22070	5351	-	-	-	-	-	-	36781	11611.7	315.69
34-35	-	26126	4327	9452	1135	-	-	-	-	-	41039	13967.7	340.35
35-36	-	4458	6280	5391	-	160	-	-	-	-	16289	5886.9	361.41
36-37	-	-	1235	3066	3014	-	922	-	-	-	8236	3349.8	406.70
37-38	-	-	-	439	2070	-	-	-	-	-	2509	1063.3	423.88
38-39	-	-	-	-	-	2219	-	-	-	-	2219	1187.7	535.29
39-40	-	-	-	-	-	-	-	1153	-	-	1153	587.4	509.44
40-41	-	-	-	-	-	430	-	430	-	146	1007	546.4	542.67
42-43	-	-	-	-	-	-	-	-	-	577	577	371.6	644.35
43-44	-	-	-	-	-	-	-	-	146	-	146	117.1	802.00
TSN(1000)	71180	90446	46553	26642	8426	2809	922	1584	146	723	249430	-	-
TSB(1000 kg)	17320.7	27190.8	15053.4	9236.4	3048.6	1492.7	412.5	813.0	117.1	447.9	-	75133.1	-
Mean length (cm)	29.74	32.34	33.17	34.06	34.67	38.14	36.00	39.27	43.00	41.60	-	-	-
Mean weight (g)	243.34	300.63	323.36	346.69	361.81	531.42	447.50	513.40	802.00	619.84	-	-	301.22

Variable: Abundance

EstLayer: 1

Stratum: 127

SpecCat: MAKRELL

	age													
LenGrp	2	3	4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	238	-	-	-	-	-	-	-	-	-	-	238	53.8	226.00
29-30	6154	-	-	-	-	-	-	-	-	-	-	6154	1461.2	237.45
30-31	11550	1029	-	-	-	-	-	-	-	-	-	12579	3249.9	258.36
31-32	772	10577	1682	-	-	-	-	-	-	-	-	13031	3803.0	291.84
32-33	-	12894	9580	-	-	-	-	-	-	-	-	22474	7117.2	316.69
33-34	-	-	20188	4887	-	-	-	-	-	-	-	25075	8503.3	339.11
34-35	-	10372	10392	9394	476	-	-	-	-	-	-	30635	11159.0	364.26
35-36	-	-	7443	19380	-	-	-	-	-	-	-	26824	10608.7	395.50
36-37	-	-	5629	3213	3150	-	-	-	-	-	-	11992	4954.5	413.15
37-38	-	-	-	7410	864	1088	-	-	-	-	-	9363	4403.1	470.27
38-39	-	-	-	1662	5363	-	2593	-	-	-	-	9618	5117.4	532.06
39-40	-	-	-	-	-	-	3783	-	257	-	-	4040	2222.6	550.18
40-41	-	-	-	-	-	-	-	3009	257	-	-	3266	2043.6	625.76
41-42	-	-	-	-	-	1756	-	-	-	-	-	1756	1069.0	608.67
43-44	-	-	-	-	-	-	-	-	-	238	-	238	193.7	813.00
44-45	-	-	-	-	-	-	-	-	238	-	-	238	204.1	857.00

46-47	|	-	-	-	-	-	-	-	-	-	-	35	35	32.4	931.00
TSN(1000)	|	18714	34873	54915	45946	9853	2844	6376	3009	753	238	35	177555	-	-
TSB(1000 kg)	|	4721.1	11127.1	19370.0	18622.4	4685.8	1562.9	3482.8	1898.3	499.9	193.7	32.4	-	66196.3	-
Mean length (cm)	|	29.69	32.23	33.53	35.08	37.08	39.47	38.59	40.00	40.92	43.00	46.00	-	-	-
Mean weight (g)	|	252.28	319.08	352.73	405.31	475.55	549.47	546.26	630.96	664.26	813.00	931.00	-	-	372.82

Variable: Abundance

EstLayer: 1

Stratum: 128

SpecCat: MAKRELL

	age														
LenGrp		2	3	4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	|	2377	-	-	-	-	-	-	-	-	-	-	2377	471.8	198.46
28-29	|	10774	-	-	-	-	-	-	-	-	-	-	10774	2288.9	212.44
29-30	|	29955	-	-	-	-	-	-	-	-	-	-	29955	6914.0	230.81
30-31	|	26447	-	-	-	-	-	-	-	-	-	-	26447	6626.3	250.55
31-32	|	4789	13403	4721	-	-	-	-	-	-	-	-	22912	6440.9	281.12
32-33	|	65	9349	21311	4789	-	-	-	-	-	-	-	35514	11112.9	312.91
33-34	|	5966	317	16941	3541	-	-	-	-	-	-	-	26765	8951.0	334.43
34-35	|	-	196	25158	5966	-	-	-	-	-	-	-	31320	11673.2	372.71
35-36	|	-	-	16706	17031	168	126	-	-	-	-	-	34030	13741.6	403.81
36-37	|	-	-	130	4306	2835	-	-	-	-	-	-	7271	3202.5	440.44
37-38	|	-	-	-	7425	252	918	1426	-	-	-	-	10021	4932.7	492.23
38-39	|	-	-	-	-	131	1377	1569	163	-	-	-	3239	1748.6	539.85
39-40	|	-	-	-	-	-	3647	1746	-	-	-	-	5393	3125.1	579.46
40-41	|	-	-	-	-	-	-	1875	-	-	-	-	1875	1144.9	610.48
41-42	|	-	-	-	-	-	-	84	1277	-	196	-	1558	952.4	611.44
42-43	|	-	-	-	-	-	-	-	-	65	-	-	65	43.4	663.00
43-44	|	-	-	-	-	-	-	-	42	-	-	-	42	29.4	700.00
44-45	|	-	-	-	-	-	-	-	-	-	-	32	32	26.8	827.00
TSN(1000)	|	80374	23265	84967	43057	3385	6068	6700	1482	65	196	32	249592	-	-
TSB(1000 kg)	|	19710.8	6884.7	29622.8	17401.4	1555.5	3422.3	3752.4	888.5	43.4	117.8	26.8	-	83426.5	-
Mean length (cm)	|	29.55	31.45	33.33	34.81	36.10	38.39	38.65	40.73	42.00	41.00	44.00	-	-	-
Mean weight (g)	|	245.24	295.92	348.64	404.15	459.47	563.99	560.07	599.51	663.00	599.67	827.00	-	-	334.25

Variable: Abundance

EstLayer: 1

Stratum: 141

SpecCat: MAKRELL

LenGrp (age)	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	30	-	-	-	-	-	-	-	-	30	8.4	275.00
32-33	-	30	-	-	-	-	-	-	-	30	9.0	297.00
33-34	61	91	-	-	-	-	-	-	-	152	50.5	332.20
34-35	-	122	273	90	-	-	-	-	-	485	167.2	345.00
35-36	-	152	395	-	-	-	-	-	-	547	212.0	387.67
36-37	-	273	91	152	-	-	-	-	-	516	208.0	402.71
37-38	-	-	-	91	-	-	-	-	-	91	41.4	454.67
38-39	-	-	-	30	61	61	-	-	-	152	76.6	504.60
39-40	-	-	-	-	61	-	61	-	-	122	64.8	533.00
40-41	-	-	-	-	61	30	-	-	-	91	48.7	534.33
41-42	-	-	-	-	-	-	-	30	30	61	37.1	610.00
42-43	-	-	-	-	30	-	-	-	-	30	18.3	604.00
43-44	-	-	-	-	-	-	-	30	-	30	20.8	685.00
TSN(1000)	91	668	759	363	213	91	61	61	30	2338	-	-
TSB(1000 kg)	27.9	250.5	284.5	149.4	114.0	47.0	31.7	38.8	19.1	-	962.8	-
Mean length (cm)	32.33	34.82	34.76	35.92	39.43	38.67	39.00	42.00	41.00	-	-	-
Mean weight (g)	306.00	374.86	374.60	411.33	535.86	515.33	521.50	638.50	628.00	-	-	411.83

Variable: Abundance

EstLayer: 1

Stratum: 142

SpecCat: MAKRELL

LenGrp (age)	4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	368	-	-	-	-	-	-	-	-	368	118.5	321.55
33-34	1518	81	-	-	-	-	-	-	-	1599	543.0	339.51
34-35	658	1284	736	-	-	-	-	-	-	2678	969.5	362.10
35-36	492	1612	1891	-	-	-	-	-	-	3995	1532.6	383.63
36-37	705	669	1876	206	244	-	-	-	-	3700	1527.6	412.88
37-38	-	278	1265	137	398	-	-	-	-	2079	912.0	438.75

38-39	-	-	1390	188	116	80	274	-	-	2049	1016.8	496.19
39-40	-	-	-	81	150	899	80	-	-	1210	625.9	517.42
40-41	-	-	-	325	324	689	-	-	-	1338	746.2	557.89
41-42	-	-	-	-	-	109	-	217	-	326	189.7	582.43
42-43	-	-	81	-	-	69	-	-	-	150	101.8	679.19
43-44	-	-	-	-	-	-	161	80	-	241	155.0	643.56
44-45	-	-	-	-	-	-	-	-	81	81	64.5	793.00
TSN(1000)	3741	3925	7240	938	1231	1845	515	297	81	19813	-	-
TSB(1000 kg)	1351.6	1499.4	3057.4	472.3	581.9	998.7	297.7	179.7	64.5	-	8503.2	-
Mean length (cm)	33.91	34.94	36.16	38.19	37.93	39.56	39.72	41.54	44.00	-	-	-
Mean weight (g)	361.26	382.02	422.30	503.51	472.63	541.40	577.76	605.66	793.00	-	-	429.17

Variable: Abundance

EstLayer: 1

Stratum: 143

SpecCat: MAKRELL

	age										
LenGrp	3	4	5	6	7	8	9	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	38	42	-	-	-	-	-	-	-	80	24.7	308.50
32-33	279	393	417	-	-	-	-	-	-	1089	335.6	308.15
33-34	375	988	2987	458	-	-	-	-	-	4808	1531.4	318.48
34-35	-	3167	5835	42	-	-	-	-	-	9045	3171.0	350.59
35-36	-	3396	4250	876	-	-	-	-	-	8521	3208.6	376.54
36-37	-	660	2264	2778	38	937	-	-	-	6677	2631.6	394.12
37-38	-	-	1621	1111	937	-	-	-	-	3669	1599.8	435.99
38-39	-	-	-	458	-	1292	840	-	-	2590	1213.6	468.57
39-40	-	-	-	-	458	-	868	-	-	1326	677.1	510.49
40-41	-	-	-	-	-	802	-	-	-	802	458.0	571.05
41-42	-	-	-	-	-	-	-	225	-	225	132.7	588.64
42-43	-	-	-	-	-	-	-	-	38	38	24.1	635.00
TSN(1000)	692	8646	17374	5723	1434	3031	1708	225	38	38872	-	-
TSB(1000 kg)	216.3	3143.8	6236.2	2304.3	686.2	1424.5	840.0	132.7	24.1	-	15008.0	-
Mean length (cm)	32.49	34.33	34.57	35.95	37.61	37.91	38.51	41.00	42.00	-	-	-
Mean weight (g)	312.78	363.59	358.93	402.64	478.56	469.96	491.83	588.64	635.00	-	-	386.09

Variable: Abundance

EstLayer: 1

Stratum: 144

SpecCat: MAKRELL

LenGrp		age 2	3	4	5	6	7	8	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	|	9670	-	-	-	-	-	-	-	-	-	9670	2398.6	248.04
30-31	|	-	10025	-	-	-	-	-	-	-	-	10025	2693.0	268.63
31-32	|	-	8610	10445	-	-	-	-	-	-	-	19055	5655.5	296.80
32-33	|	-	-	49717	-	-	-	-	-	-	-	49717	15706.7	315.92
33-34	|	-	-	135613	14252	-	-	-	-	-	-	149865	51424.6	343.14
34-35	|	-	8704	124060	33446	627	-	-	-	-	-	166837	60301.7	361.44
35-36	|	-	-	19903	103844	196	-	-	-	-	-	123942	47408.1	382.50
36-37	|	-	-	131	14361	46940	-	-	-	-	-	61432	25497.2	415.05
37-38	|	-	-	-	-	-	20951	-	-	-	-	20951	9727.6	464.30
38-39	|	-	-	-	-	-	9645	105	-	-	-	9750	4616.8	473.52
39-40	|	-	-	-	-	-	14538	-	-	-	-	14538	7781.8	535.27
40-41	|	-	-	-	-	4803	-	-	-	-	-	4803	2756.7	574.00
41-42	|	-	-	-	-	-	-	-	1741	-	-	1741	1232.5	708.00
42-43	|	-	-	-	-	-	-	-	9605	4803	-	14408	10599.3	735.67
43-44	|	-	-	-	-	-	-	-	-	-	4803	4803	3798.8	791.00
TSN(1000)	|	9670	27339	339867	165903	52566	45134	105	11346	4803	4803	661536	-	-
TSB(1000 kg)	|	2398.6	8318.9	118178.5	62419.1	22527.0	22075.6	50.6	8124.1	3707.6	3798.8	-	251599.0	-
Mean length (cm)	|	29.00	31.59	33.28	34.71	36.34	37.86	38.00	41.85	42.00	43.00	-	-	-
Mean weight (g)	|	248.04	304.29	347.72	376.24	428.55	489.11	481.48	716.04	772.00	791.00	-	-	380.33

Variable: Abundance

EstLayer: 1

Stratum: 145

SpecCat: MAKRELL

LenGrp		age 2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	|	121	-	-	-	-	-	-	121	30.0	248.00
30-31	|	6965	7903	-	-	-	-	-	14869	4144.8	278.76
31-32	|	5861	13374	-	-	-	-	-	19235	5939.4	308.78
32-33	|	-	33411	12645	-	-	-	-	46056	15278.9	331.75

33-34	-	2288	68656	9157	-	-	-	80101	27212.9	339.73
34-35	-	845	77267	29554	-	-	-	107666	39719.4	368.91
35-36	-	-	26658	27210	1684	483	-	56036	21988.1	392.39
36-37	-	-	-	14729	242	6282	-	21252	9203.5	433.06
37-38	-	-	-	13611	561	-	3476	17648	8649.1	490.09
38-39	-	-	-	-	-	6443	2793	9236	4433.8	480.03
40-41	-	-	-	-	-	281	-	281	164.2	585.00
TSN(1000)	12947	57822	185225	94260	2487	13489	6269	372500	-	-
TSB(1000 kg)	3536.1	18997.5	65486.2	38345.0	1055.4	6199.8	3144.2	-	136764.1	-
Mean length (cm)	30.44	31.56	33.64	34.94	35.55	37.00	37.45	-	-	-
Mean weight (g)	273.11	328.55	353.55	406.80	424.31	459.63	501.55	-	-	367.15

Variable: Abundance

EstLayer: 1

Stratum: 146

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	18720	-	-	-	-	-	-	-	-	-	18720	4963.7	265.16
31-32	2388	21142	8748	14518	-	-	-	-	-	-	46796	13932.9	297.74
32-33	-	6314	42920	11828	10192	-	-	-	-	-	71255	22995.2	322.72
33-34	-	20425	52182	11142	1916	-	-	-	-	-	85665	29137.0	340.13
34-35	-	5577	47368	14397	7664	-	-	-	-	-	75007	27470.7	366.24
35-36	-	-	11615	19195	17245	-	-	-	-	-	48055	19078.4	397.01
36-37	-	-	2447	25538	7340	5387	-	-	-	-	40713	17351.9	426.20
37-38	-	-	-	5117	2447	5468	-	-	-	-	13033	6015.8	461.59
38-39	-	-	-	-	-	8298	-	-	-	-	8298	4432.2	534.12
39-40	-	-	-	-	2006	-	2566	-	-	-	4572	2531.9	553.85
40-41	-	-	-	-	-	-	3258	-	-	-	3258	2041.7	626.70
41-42	-	-	-	-	-	-	-	118	118	-	237	137.6	581.50
42-43	-	-	-	-	-	-	1105	-	-	1164	2269	1523.1	671.15
TSN(1000)	21108	53458	165280	101736	48811	19153	6929	118	118	1164	417876	-	-
TSB(1000 kg)	5654.1	17569.6	57441.5	37606.3	18951.0	9301.0	4175.0	73.0	64.6	776.1	-	151612.2	-
Mean length (cm)	30.11	32.20	33.11	34.07	34.55	37.15	39.95	41.00	41.00	42.00	-	-	-
Mean weight (g)	267.87	328.66	347.54	369.65	388.25	485.61	602.58	617.00	546.00	666.55	-	-	362.82

Variable: Abundance

EstLayer: 1

Stratum: 147

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	408	408	-	-	-	-	-	-	-	815	227.9	279.50
31-32	2038	11361	5282	-	-	-	-	-	-	18682	5585.8	298.99
32-33	382	31058	13950	-	-	-	-	-	-	45391	14758.6	325.15
33-34	-	13472	32731	11712	-	-	-	-	-	57915	19997.2	345.29
34-35	-	510	53688	21821	1223	-	-	-	-	77242	28794.6	372.79
35-36	-	-	3128	70383	542	-	-	-	-	74053	30100.3	406.47
36-37	-	-	-	27155	1843	-	-	892	-	29890	13235.1	442.79
37-38	-	-	-	-	6047	6098	-	-	-	12145	5665.5	466.50
38-39	-	-	-	-	127	382	-	-	-	510	271.6	533.00
39-40	-	-	-	-	2896	127	127	127	-	3278	1790.2	546.10
40-41	-	-	-	-	-	-	2896	-	-	2896	1692.7	584.50
42-43	-	-	-	-	-	-	-	-	127	127	94.9	745.00
TSN(1000)	2828	56808	108780	131072	12678	6607	3023	1019	127	322944	-	-
TSB(1000 kg)	868.2	18321.5	39186.0	52425.0	5902.4	3172.3	1772.1	472.0	94.9	-	122214.4	-
Mean length (cm)	30.99	32.04	33.33	34.86	36.95	37.10	39.96	36.38	42.00	-	-	-
Mean weight (g)	306.97	322.51	360.23	399.97	465.55	480.12	586.13	463.13	745.00	-	-	378.44

Variable: Abundance

EstLayer: 1

Stratum: 148

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	2719	-	-	-	-	-	-	-	-	2719	720.5	265.00
29-30	4319	-	-	-	-	-	-	-	-	4319	1076.1	249.17
30-31	17866	26	-	-	-	-	-	-	-	17892	4776.8	266.97
31-32	9879	20350	-	-	-	-	-	-	-	30230	8890.6	294.10
32-33	-	23927	16454	6671	-	-	-	-	-	47053	14987.3	318.52
33-34	-	5161	32528	69457	-	-	-	-	-	107147	37186.9	347.07

34-35	-	-	58432	57787	787	-	-	-	-	117006	43478.6	371.59
35-36	-	3449	7164	52113	787	-	-	-	-	63514	25683.1	404.37
36-37	-	-	2587	17517	26933	2362	-	-	-	49399	21641.6	438.10
37-38	-	-	394	12455	5409	-	-	-	-	18258	8615.1	471.86
38-39	-	-	-	-	5516	-	52	2337	-	7906	4226.4	534.60
39-40	-	-	-	-	-	2745	2389	-	-	5134	2805.2	546.36
40-41	-	-	-	26	52	862	-	394	-	1334	776.5	581.92
41-42	-	-	-	-	-	-	-	420	-	420	245.5	584.78
43-44	-	-	-	-	-	-	-	-	737	737	574.4	779.00
TSN(1000)	34783	52915	117560	216026	39485	5970	2441	3150	737	473068	-	-
TSB(1000 kg)	9451.2	16635.9	42511.1	82456.4	18068.2	3016.0	1332.3	1638.8	574.4	-	175684.4	-
Mean length (cm)	29.93	31.91	33.56	34.19	36.36	37.96	38.98	38.65	43.00	-	-	-
Mean weight (g)	271.72	314.39	361.61	381.70	457.60	505.23	545.72	520.17	779.00	-	-	371.37

Variable: Abundance

EstLayer: 1

Stratum: 159

SpecCat: MAKRELL

	age					
LenGrp	5	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
37-38	53	-	-	53	22.0	417.00
38-39	53	-	-	53	22.2	421.00
39-40	-	53	53	105	55.8	529.50
TSN(1000)	105	53	53	211	-	-
TSB(1000 kg)	44.2	27.6	28.2	-	100.0	-
Mean length (cm)	37.50	39.00	39.00	-	-	-
Mean weight (g)	419.00	524.00	535.00	-	-	474.25

Variable: Abundance

EstLayer: 1

Stratum: 161

SpecCat: MAKRELL

	age									
LenGrp	2	4	5	6	7	8	9	Number	Biomass	Mean W

								(1E3)	(1E3kg)	(g)
28-29	22	-	-	-	-	-	-	22	6.0	270.00
34-35	-	44	-	-	-	-	-	44	15.0	338.50
35-36	-	44	133	-	-	-	-	178	64.7	364.00
36-37	-	-	-	67	44	-	-	111	45.9	412.60
37-38	-	-	-	22	-	22	-	44	19.5	438.00
38-39	-	-	-	67	44	-	-	111	51.1	459.40
39-40	-	-	-	-	-	89	-	89	46.8	526.75
40-41	-	-	-	-	-	-	67	67	38.8	581.33
41-42	-	-	-	22	-	-	22	44	23.8	535.50
TSN(1000)	22	89	133	178	89	111	89	711	-	-
TSB(1000 kg)	6.0	30.8	49.0	78.4	38.9	57.8	50.7	-	311.6	-
Mean length (cm)	28.00	34.50	35.00	37.50	37.00	38.60	40.25	-	-	-
Mean weight (g)	270.00	346.50	367.17	441.00	437.00	520.20	570.25	-	-	438.03

Variable: Abundance

EstLayer: 1

Stratum: 162

SpecCat: MAKRELL

LenGrp	age 2	4	5	6	7	8	10	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	358	770	-	-	-	-	-	-	-	1128	362.2	320.93
33-34	-	-	2417	-	-	-	-	-	-	2417	786.7	325.52
34-35	-	930	5192	1792	-	-	-	-	-	7914	2820.6	356.41
35-36	-	2896	5749	2867	-	-	-	-	-	11512	4428.1	384.64
36-37	-	107	586	2974	5231	107	-	-	-	9004	3734.9	414.81
37-38	-	-	213	1501	1075	1434	-	-	-	4223	1863.4	441.20
38-39	-	-	-	1075	107	1128	-	213	-	2523	1254.0	496.93
39-40	-	-	-	-	-	770	53	-	-	823	416.1	505.39
40-41	-	-	-	-	-	-	412	-	-	412	241.2	585.85
41-42	-	-	-	53	53	-	-	-	-	107	54.5	511.50
43-44	-	-	-	-	-	-	-	-	358	358	267.7	747.00
TSN(1000)	358	4703	14157	10263	6466	3439	465	213	358	40422	-	-
TSB(1000 kg)	114.7	1672.7	5211.1	4197.1	2743.4	1651.2	267.5	103.9	267.7	-	16229.3	-
Mean length (cm)	32.00	34.33	34.36	35.75	36.24	37.75	39.89	38.00	43.00	-	-	-
Mean weight (g)	320.00	355.67	368.09	408.96	424.29	480.19	575.32	487.50	747.00	-	-	401.49

Variable: Abundance

EstLayer: 1

Stratum: 163

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	8553	10357	-	-	-	-	-	-	-	18910	5786.7	306.01
32-33	-	-	9455	31739	-	-	-	-	-	41194	13478.9	327.20
33-34	-	17106	64147	74070	-	-	-	-	-	155323	53176.2	342.36
34-35	-	17106	115030	63713	8553	-	-	-	-	204402	76080.4	372.21
35-36	-	-	29935	141391	17106	-	-	-	-	188432	72771.1	386.19
36-37	-	-	76976	118205	-	-	36250	-	-	231431	96965.8	418.98
37-38	-	-	20714	-	34446	4276	-	-	-	59436	27273.8	458.87
38-39	-	-	-	-	18910	-	5179	-	-	24089	12252.8	508.65
39-40	-	-	-	-	-	-	5179	-	-	5179	2749.8	531.00
40-41	-	-	-	-	-	4276	-	4276	4276	12829	7629.2	594.67
42-43	-	-	-	-	4276	-	-	-	-	4276	2784.0	651.00
TSN(1000)	8553	44569	316258	429118	83291	8553	46607	4276	4276	945501	-	-
TSB(1000 kg)	2689.9	15678.1	119686.4	164429.2	38874.6	4635.7	19870.1	2450.4	2634.3	-	370948.7	-
Mean length (cm)	31.00	32.92	34.52	34.56	36.76	38.50	36.56	40.00	40.00	-	-	-
Mean weight (g)	314.50	351.77	378.45	383.18	466.73	542.00	426.33	573.00	616.00	-	-	392.33

Variable: Abundance

EstLayer: 1

Stratum: 164

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	-	152	-	-	-	-	-	-	152	43.6	286.46
31-32	701	-	-	-	-	-	-	-	701	216.2	308.19
32-33	-	2746	913	-	-	-	-	-	3659	1225.0	334.80
33-34	-	2410	10773	304	-	-	-	-	13488	4843.8	359.11
34-35	-	-	7160	13021	-	-	-	-	20181	7809.4	386.97

35-36	|	-	-	2946	9290	8035	-	-	-	20271	8246.6	406.81
36-37	|	-	-	573	1737	6234	-	-	-	8544	3702.5	433.35
37-38	|	-	-	-	945	1411	34	-	-	2391	1104.7	462.07
38-39	|	-	-	-	-	-	860	-	-	860	451.4	524.83
39-40	|	-	-	-	-	-	681	179	-	860	444.1	516.39
40-41	|	-	-	-	-	-	-	298	-	298	166.8	560.49
41-42	|	-	-	-	-	-	-	-	124	124	75.7	609.67
44-45	|	-	-	-	-	-	-	90	-	90	66.1	737.00
TSN(1000)	|	701	5308	22366	25297	15680	1575	567	124	71619	-	-
TSB(1000 kg)	|	216.2	1846.8	8353.1	10134.4	6625.7	823.9	320.2	75.7	-	28395.8	-
Mean length (cm)	|	31.00	32.40	33.62	34.60	35.58	38.41	40.32	41.00	-	-	-
Mean weight (g)	|	308.19	347.91	373.47	400.61	422.55	523.04	565.01	609.67	-	-	396.48

Variable: Abundance

EstLayer: 1

Stratum: 165

SpecCat: MAKRELL

	age									
LenGrp		3	4	5	6	7	8	Number	Biomass	Mean W
								(1E3)	(1E3kg)	(g)
31-32	|	-	164	-	-	-	-	164	49.6	302.00
32-33	|	357	-	-	-	-	-	357	114.4	320.48
33-34	|	781	1563	917	-	-	-	3261	1169.2	358.49
34-35	|	-	2576	1149	4689	-	-	8414	3202.3	380.59
35-36	|	-	4546	5781	1302	-	-	11629	4642.4	399.20
36-37	|	-	-	7423	1042	985	-	9449	4095.6	433.43
37-38	|	-	-	-	2616	-	1302	3918	1863.5	475.61
38-39	|	-	-	-	521	821	-	1342	674.9	502.98
39-40	|	-	-	-	-	328	2027	2355	1244.8	528.54
40-41	|	-	-	-	657	-	521	1178	646.6	549.09
41-42	|	-	-	-	-	260	328	589	363.2	616.90
TSN(1000)	|	1139	8850	15269	10826	2394	4179	42657	-	-
TSB(1000 kg)	|	399.9	3400.2	6229.8	4663.7	1195.3	2177.5	-	18066.4	-
Mean length (cm)	|	32.69	34.28	35.29	35.59	37.64	38.66	-	-	-
Mean weight (g)	|	351.27	384.22	407.99	430.78	499.20	521.12	-	-	423.53

Variable: Abundance

EstLayer: 1

Stratum: 166

SpecCat: MAKRELL

LenGrp		age 3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	|	-	6590	-	-	-	-	-	6590	1753.0	266.00
31-32	|	1410	7272	-	-	-	-	-	8682	2582.0	297.41
32-33	|	7173	16781	-	-	-	-	-	23953	8155.6	340.48
33-34	|	4089	64731	2333	1363	-	-	-	72517	25352.5	349.61
34-35	|	-	82603	46862	-	-	-	-	129464	49196.8	380.00
35-36	|	7612	155113	19999	19771	56	-	-	202551	81463.7	402.19
36-37	|	-	20083	78053	53506	-	347	-	151989	65025.7	427.83
37-38	|	-	-	201	27736	26361	56	-	54354	24434.9	449.55
38-39	|	-	-	-	56	-	-	33007	33062	16919.9	511.76
39-40	|	-	-	-	-	-	6736	-	6736	3882.0	576.32
40-41	|	-	-	-	-	6590	-	-	6590	3954.1	600.00
41-42	|	-	-	-	-	-	-	13180	13180	8666.1	657.50
TSN(1000)	|	20284	353172	147449	102431	33007	7139	46187	709669	-	-
TSB(1000 kg)	|	7257.6	134425.0	61217.4	42692.9	16178.9	4058.9	25555.7	-	291386.4	-
Mean length (cm)	|	33.26	34.14	35.18	36.04	37.60	38.84	38.86	-	-	-
Mean weight (g)	|	357.79	380.62	415.18	416.79	490.17	568.59	553.31	-	-	410.59

Variable: Abundance

EstLayer: 1

Stratum: 167

SpecCat: MAKRELL

LenGrp		age 3	4	5	6	8	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	|	184	-	-	-	-	-	184	54.4	295.50
32-33	|	329	97	-	-	-	-	426	141.2	331.61
33-34	|	242	802	435	-	-	-	1479	515.0	348.25
34-35	|	193	462	621	145	-	-	1421	538.5	378.90
35-36	|	242	230	138	-	-	-	610	246.0	403.44
36-37	|	-	472	278	-	-	-	750	330.7	440.80
39-40	|	-	-	-	-	46	-	46	25.4	552.00

41-42	-	-	-	-	48	-	48	31.5	652.00
43-44	-	-	-	-	-	48	48	24.9	515.00
TSN(1000)	1190	2063	1472	145	94	48	5012	-	-
TSB(1000 kg)	420.8	791.5	559.2	54.3	56.9	24.9	-	1907.5	-
Mean length (cm)	32.98	34.09	34.18	34.00	40.02	43.00	-	-	-
Mean weight (g)	353.71	383.62	379.89	374.33	603.22	515.00	-	-	380.56

Variable: Abundance

EstLayer: 1

Stratum: 182

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	-	179	-	-	-	-	-	-	-	179	56.5	316.18
36-37	96	30	31	89	61	-	-	-	-	306	123.8	404.78
37-38	-	244	59	191	-	89	-	-	-	582	258.3	443.54
38-39	-	30	30	118	-	-	-	-	-	177	90.0	507.00
39-40	-	-	-	31	61	59	31	-	-	182	90.1	495.71
40-41	-	-	-	-	89	160	-	-	-	248	129.4	520.93
41-42	-	-	-	-	-	95	-	-	-	95	51.5	544.06
42-43	-	-	-	-	-	-	-	-	30	30	19.6	664.00
43-44	-	-	-	-	-	-	31	-	-	31	21.2	683.00
44-45	-	-	-	-	-	-	-	30	-	30	24.1	816.00
TSN(1000)	96	482	120	429	210	402	62	30	30	1859	-	-
TSB(1000 kg)	40.3	180.9	55.8	201.2	101.3	205.1	36.1	24.1	19.6	-	864.5	-
Mean length (cm)	36.00	36.26	36.99	37.21	38.56	39.43	41.00	44.00	42.00	-	-	-
Mean weight (g)	419.87	375.41	466.19	469.38	482.54	510.06	583.00	816.00	664.00	-	-	464.94

Variable: Abundance

EstLayer: 1

Stratum: 183

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	Number	Biomass	Mean W

LenGrp										Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	|	58	-	-	-	-	-	-	-	58	19.4	333.00
32-33	|	137	-	-	-	-	-	-	-	137	46.6	341.00
33-34	|	-	701	331	-	-	-	-	-	1032	373.1	361.50
34-35	|	-	837	1520	-	-	-	-	-	2357	893.3	378.96
35-36	|	116	943	3077	1217	-	-	-	-	5354	2180.6	407.32
36-37	|	-	289	3398	1093	564	-	-	-	5344	2276.3	426.00
37-38	|	-	-	1098	357	124	233	956	-	2767	1252.4	452.62
38-39	|	-	-	753	175	837	248	-	349	2362	1166.4	493.94
39-40	|	-	-	-	233	124	964	-	233	1554	828.8	533.38
40-41	|	-	-	-	-	-	-	825	-	825	484.9	588.05
41-42	|	-	-	-	-	-	137	-	137	273	167.9	614.50
43-44	|	-	-	-	-	-	-	58	-	58	38.9	668.00
TSN(1000)	|	311	2770	10177	3073	1649	1582	1839	718	22119	-	-
TSB(1000 kg)	|	112.0	1071.4	4242.8	1359.6	762.3	840.2	965.0	375.1	-	9728.5	-
Mean length (cm)	|	32.94	34.30	35.56	36.06	37.32	38.72	38.54	38.89	-	-	-
Mean weight (g)	|	359.89	386.75	416.91	442.42	462.25	531.22	524.82	522.23	-	-	439.82

Variable: Abundance

EstLayer: 1

Stratum: 184

SpecCat: MAKRELL

LenGrp	age	3	4	5	6	7	8	9	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	|	371	-	-	-	-	-	-	-	-	371	129.2	347.96
34-35	|	-	772	-	-	-	-	-	-	-	772	311.8	403.80
35-36	|	-	2533	1143	-	-	-	-	-	-	3677	1501.1	408.24
36-37	|	-	-	1081	2625	835	-	-	-	-	4541	2000.2	440.47
37-38	|	-	-	-	1452	-	526	-	-	-	1978	872.5	441.10
38-39	|	-	-	-	463	927	618	-	-	-	2008	1072.7	534.31
39-40	|	-	-	-	-	1206	618	618	-	-	2441	1353.3	554.30
40-41	|	-	-	-	-	-	309	-	463	-	772	487.6	631.40
41-42	|	-	-	-	-	-	-	526	-	-	526	347.1	660.21
42-43	|	-	-	-	-	-	-	-	-	154	154	102.2	662.00
44-45	|	-	-	-	-	-	-	-	154	-	154	121.4	786.00
TSN(1000)	|	371	3306	2225	4541	2967	2070	1143	618	154	17396	-	-
TSB(1000 kg)	|	129.2	1334.0	969.6	2043.3	1512.1	1091.7	708.3	408.5	102.2	-	8299.1	-

Mean length (cm)	33.00	34.77	35.49	36.52	37.84	38.34	39.92	41.00	42.00	-	-	-
Mean weight (g)	347.96	403.57	435.88	449.96	509.62	527.37	619.44	661.25	662.00	-	-	477.08

Variable: Abundance

EstLayer: 1

Stratum: 185

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	90	-	-	-	-	-	-	90	28.1	314.00
32-33	90	179	-	-	-	-	-	269	89.5	333.00
33-34	-	448	-	-	-	-	-	448	169.3	378.00
34-35	-	1165	90	-	-	-	-	1254	461.0	367.57
35-36	-	5626	1075	-	-	-	-	6701	2694.0	402.05
36-37	-	90	8483	806	-	-	-	9379	3888.8	414.63
37-38	-	-	2678	2678	2410	5267	-	13034	6025.5	462.30
38-39	-	-	-	2410	2410	2947	537	8304	4347.9	523.59
39-40	-	-	-	-	-	2947	-	2947	1600.7	543.12
40-41	-	-	-	-	90	-	-	90	53.5	597.00
41-42	-	-	-	-	90	90	-	179	109.5	611.00
TSN(1000)	179	7507	12326	5894	4999	11251	537	42694	-	-
TSB(1000 kg)	58.4	2946.4	5113.5	2692.0	2729.7	5655.3	272.4	-	19467.7	-
Mean length (cm)	31.50	34.67	36.12	37.27	37.61	37.82	38.00	-	-	-
Mean weight (g)	326.00	392.50	414.85	456.71	546.10	502.64	506.83	-	-	455.99

Variable: Abundance

EstLayer: 1

Stratum: 186

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	36	-	-	-	-	-	36	11.8	329.00
32-33	-	36	36	-	-	-	72	22.4	312.00

33-34	-	72	-	36	-	-	108	35.8	332.33
34-35	-	36	179	-	-	-	215	76.7	356.17
35-36	36	72	2777	-	-	-	2885	892.6	309.41
36-37	-	-	108	-	-	-	108	44.3	411.00
37-38	-	-	83	-	36	-	119	54.0	453.51
41-42	-	-	-	1239	-	1239	2479	1521.8	614.00
TSN(1000)	72	215	3183	1275	36	1239	6021	-	-
TSB(1000 kg)	25.8	73.2	1010.0	889.9	16.2	644.4	-	2659.4	-
Mean length (cm)	33.00	33.67	35.00	40.77	37.00	41.00	-	-	-
Mean weight (g)	359.00	339.67	317.26	697.87	451.00	520.00	-	-	441.69

Variable: Abundance

EstLayer: 1

Stratum: 201

SpecCat: MAKRELL

LenGrp	age 10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
42-43	157	157	94.7	603.00
TSN(1000)	157	157	-	-
TSB(1000 kg)	94.7	-	94.7	-
Mean length (cm)	42.00	-	-	-
Mean weight (g)	603.00	-	-	603.00

Variable: Abundance

EstLayer: 1

Stratum: 203

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	-	151	-	-	-	-	-	-	151	56.7	375.61
36-37	108	427	217	-	108	-	-	-	860	371.7	432.26
37-38	-	-	689	384	-	128	-	-	1201	551.4	459.04

38-39	|	-	384	325	758	-	217	-	-	1684	807.0	479.19
39-40	|	-	-	256	85	194	581	194	-	1310	687.2	524.72
40-41	|	-	-	-	360	171	171	-	-	701	394.8	562.96
41-42	|	-	-	-	-	345	279	120	178	922	566.6	614.51
42-43	|	-	-	-	-	384	-	-	-	384	248.3	647.20
43-44	|	-	-	-	-	-	-	-	349	349	253.9	727.99
TSN(1000)	|	108	962	1487	1588	1201	1375	314	527	7562	-	-
TSB(1000 kg)	|	46.8	421.7	705.7	788.8	703.9	732.6	184.7	353.6	-	3937.7	-
Mean length (cm)	|	36.00	36.64	37.42	38.27	40.40	39.19	39.77	42.32	-	-	-
Mean weight (g)	|	432.00	438.54	474.56	496.84	586.04	532.68	588.41	671.00	-	-	520.74

Variable: Abundance

EstLayer: 1

Stratum: 204

SpecCat: MAKRELL

	age											
LenGrp		3	4	5	6	7	8	9	10	Number	Biomass	Mean W
										(1E3)	(1E3kg)	(g)
33-34	|	-	109	-	-	-	-	-	-	109	38.3	353.00
34-35	|	109	-	-	-	-	-	-	-	109	46.5	428.00
35-36	|	-	-	868	-	-	-	-	-	868	345.8	398.25
36-37	|	-	-	651	812	-	326	-	-	1789	789.1	441.09
37-38	|	-	-	-	760	977	-	-	-	1737	838.3	482.75
38-39	|	-	-	-	760	-	1194	-	-	1954	960.2	491.50
39-40	|	-	-	-	-	977	-	921	217	2115	1135.1	536.79
40-41	|	-	-	-	651	-	-	868	-	1519	859.6	565.71
41-42	|	-	-	-	-	434	-	-	-	434	277.4	639.00
42-43	|	-	-	-	-	-	109	-	-	109	76.2	702.00
43-44	|	-	-	-	-	-	-	-	109	109	83.5	769.00
44-45	|	-	-	-	-	-	-	109	-	109	85.4	787.00
TSN(1000)	|	109	109	1519	2983	2388	1628	1897	326	10958	-	-
TSB(1000 kg)	|	46.5	38.3	638.6	1449.4	1265.4	816.7	1073.5	206.9	-	5535.3	-
Mean length (cm)	|	34.00	33.00	35.43	37.64	38.55	37.87	39.74	40.33	-	-	-
Mean weight (g)	|	428.00	353.00	420.29	485.92	529.95	501.67	565.77	635.33	-	-	505.13

Variable: Abundance

EstLayer: 1

Stratum: 205

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	40	-	-	-	-	-	-	40	14.3	353.00
36-37	-	67	-	-	-	-	-	67	27.8	416.00
37-38	-	-	40	-	-	-	-	40	18.5	458.00
38-39	-	40	-	-	-	-	-	40	17.3	428.00
39-40	-	-	-	33	74	35	-	142	69.1	486.37
40-41	-	-	-	-	-	33	33	67	37.3	558.00
41-42	-	-	-	-	-	33	-	33	20.2	604.00
TSN(1000)	40	107	40	33	74	102	33	430	-	-
TSB(1000 kg)	14.3	45.1	18.5	15.7	37.7	53.2	19.9	-	204.4	-
Mean length (cm)	35.00	36.75	37.00	39.00	39.00	39.99	40.00	-	-	-
Mean weight (g)	353.00	420.52	458.00	469.00	511.43	523.55	596.00	-	-	475.02

Variable: Abundance

EstLayer: 1

Stratum: 221

SpecCat: MAKRELL

LenGrp	age 6	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
40-41	127	-	-	127	73.8	580.50
42-43	-	64	64	127	84.5	664.50
TSN(1000)	127	64	64	254	-	-
TSB(1000 kg)	73.8	42.5	42.0	-	158.3	-
Mean length (cm)	40.00	42.00	42.00	-	-	-
Mean weight (g)	580.50	668.00	661.00	-	-	622.50

IESSNS 2011. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 62

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	-	56	-	-	-	-	-	-	-	56	18.5	326.80
34-35	210	113	-	-	-	-	-	-	-	-	323	129.3	400.92
35-36	-	115	56	629	-	56	-	-	-	-	857	331.7	387.27
36-37	-	-	476	1244	57	56	-	-	-	-	1833	776.6	423.60
37-38	-	-	-	1245	-	-	-	-	-	-	1245	580.1	466.05
38-39	-	-	-	-	1093	-	-	-	-	-	1093	592.8	542.50
39-40	-	-	-	210	-	616	57	-	210	-	1093	654.1	598.57
40-41	-	-	-	56	559	-	56	406	-	-	1077	647.5	600.99
41-42	-	-	-	-	-	56	-	336	-	-	392	253.3	645.64
42-43	-	-	-	-	-	-	-	210	56	-	266	169.8	638.35
43-44	-	-	-	-	-	-	-	-	-	56	56	41.3	731.50
TSN(1000)	210	228	589	3383	1709	786	114	951	266	56	8291	-	-
TSB(1000 kg)	84.4	87.8	257.8	1476.0	968.7	470.9	65.1	596.9	146.1	41.3	-	4194.9	-
Mean length (cm)	34.00	34.50	35.52	36.43	38.59	38.64	39.50	40.79	39.64	43.00	-	-	-
Mean weight (g)	403.03	384.94	438.05	436.31	566.84	599.30	570.98	627.63	549.09	731.50	-	-	505.95

Variable: Abundance

EstLayer: 1

Stratum: 67

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	11806	-	-	-	-	-	-	-	-	-	11806	1794.4	152.00
24-25	1148	-	-	-	-	-	-	-	-	-	1148	144.6	126.00
25-26	594	-	-	-	-	-	-	-	-	-	594	96.2	162.00
26-27	37712	-	-	-	-	-	-	-	-	-	37712	6900.0	182.97
27-28	1782	75505	-	-	-	-	-	-	-	-	77287	14525.5	187.94
28-29	-	196365	-	-	-	-	-	-	-	-	196365	40364.0	205.56
29-30	-	81919	48676	-	-	-	-	-	-	-	130594	31916.3	244.39

30-31	-	-	226735	-	-	-	-	-	-	-	226735	58345.2	257.33
31-32	-	-	24979	-	188889	-	-	-	-	-	213868	59435.9	277.91
32-33	-	11806	57079	51300	40007	-	-	-	-	-	160192	48936.0	305.48
33-34	-	-	-	-	147792	-	-	-	-	-	147792	47835.2	323.67
34-35	-	-	-	-	87824	-	-	-	-	-	87824	31839.9	362.54
35-36	-	-	-	-	41790	-	-	-	-	-	41790	16721.6	400.14
36-37	-	-	11806	1148	594	-	-	1188	-	-	14736	6173.2	418.93
37-38	-	-	-	-	15843	-	-	-	-	-	15843	6840.2	431.76
38-39	-	-	-	-	-	12400	-	-	-	-	12400	6525.5	526.26
39-40	-	-	-	-	-	-	1148	-	-	-	1148	670.2	584.00
40-41	-	-	-	-	-	-	-	-	-	1148	1148	573.8	500.00
41-42	-	-	-	-	-	-	-	-	1148	-	1148	608.3	530.00
TSN(1000)	53042	365594	369274	52448	522739	12400	1148	1188	1148	1148	1380127	-	-
TSB(1000 kg)	9290.6	78547.3	99393.4	16106.9	168075.1	6525.5	670.2	455.1	608.3	573.8	-	380246.2	-
Mean length (cm)	25.31	28.15	30.44	32.09	32.65	38.00	39.00	36.00	41.00	40.00	-	-	-
Mean weight (g)	175.16	214.85	269.16	307.10	321.53	526.26	584.00	383.00	530.00	500.00	-	-	275.52

Variable: Abundance

EstLayer: 1

Stratum: 80

SpecCat: MAKRELL

	age									
LenGrp	3	4	5	6	7	8	10	Number	Biomass	Mean W
								(1E3)	(1E3kg)	(g)
33-34	292	-	-	-	-	-	-	292	93.0	318.20
35-36	-	-	2047	-	-	-	-	2047	825.8	403.49
36-37	-	-	-	-	4386	-	-	4386	2183.5	497.88
37-38	1462	2631	-	1754	-	-	-	5848	2649.4	453.08
38-39	-	-	-	6725	-	-	-	6725	3679.0	547.10
39-40	-	-	-	-	4093	292	-	4386	2485.7	566.79
40-41	-	-	-	-	-	2924	-	2924	1690.2	578.09
41-42	-	-	-	-	-	-	1754	1754	1191.6	679.25
42-43	-	-	-	-	-	-	292	292	218.7	748.00
43-44	-	-	-	-	-	-	585	585	417.2	713.50
TSN(1000)	1754	2631	2047	8479	8479	3216	2631	29238	-	-
TSB(1000 kg)	764.9	1092.4	825.8	4564.2	4506.8	1852.6	1827.5	-	15434.2	-
Mean length (cm)	36.33	37.00	35.00	37.79	37.45	39.91	41.56	-	-	-
Mean weight (g)	436.00	415.13	403.49	538.31	531.53	576.05	694.50	-	-	527.89

Variable: Abundance

EstLayer: 1

Stratum: 82

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	21	-	-	-	-	-	-	-	-	-	-	-	21	4.0	196.40
31-32	285	-	-	-	-	-	-	-	-	-	-	-	285	82.9	291.10
32-33	-	874	2335	21	-	-	-	-	-	-	-	-	3231	1026.3	317.67
33-34	1749	10906	-	-	-	-	-	-	-	-	-	-	12655	4546.6	359.26
34-35	-	105	16347	3236	82	-	-	-	-	-	-	-	19771	8029.0	406.10
35-36	-	590	-	36494	19173	-	-	-	-	-	-	-	56256	24203.8	430.24
36-37	-	-	26954	29272	12304	-	103	-	-	-	-	-	68632	31607.7	460.54
37-38	-	-	-	24944	2054	-	-	-	-	-	-	-	26998	13275.7	491.73
38-39	-	-	-	84	2075	127	14458	-	-	-	-	-	16744	9146.7	546.26
39-40	-	-	-	-	369	10906	-	2704	-	-	-	-	13979	7772.1	556.00
40-41	-	-	-	-	-	-	-	569	4101	168	-	-	4839	2922.8	604.03
41-42	-	-	-	-	-	-	-	41	4407	-	-	-	4448	2840.0	638.47
42-43	-	-	-	-	-	-	21	-	-	-	2051	-	2072	1446.9	698.40
43-44	-	-	-	-	-	4101	-	-	-	-	-	21	4122	3000.1	727.75
TSN(1000)	2054	12476	45636	94051	36057	15134	14583	3314	8508	168	2051	21	234053	-	-
TSB(1000 kg)	725.1	4478.9	19589.5	43104.3	16229.1	9103.0	7958.7	1873.6	5294.7	99.8	1433.4	14.3	-	109904.6	-
Mean length (cm)	32.68	33.03	35.08	35.81	35.67	40.08	37.99	39.20	40.52	40.00	42.00	43.00	-	-	-
Mean weight (g)	353.00	359.00	429.26	458.31	450.10	601.51	545.77	565.31	622.30	593.08	699.00	679.00	-	-	469.57

Variable: Abundance

EstLayer: 1

Stratum: 83

SpecCat: MAKRELL

LenGrp	age 1	3	4	5	6	7	8	9	10	12	13	14	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
18-19	-	-	-	-	-	-	-	-	-	-	-	-	23528	23528	1250.1	53.13
19-20	-	-	-	-	-	-	-	-	-	-	-	-	105138	105138	5660.6	53.84

20-21	-	-	-	-	-	-	-	-	-	-	-	-	73725	73725	4500.2	61.04
21-22	4803	-	-	-	-	-	-	-	-	-	-	-	-	4803	378.7	78.85
25-26	75	-	-	-	-	-	-	-	-	-	-	-	-	75	9.6	128.30
30-31	-	75	-	-	-	-	-	-	-	-	-	-	-	75	21.0	280.10
31-32	-	75	-	75	-	-	-	-	-	-	-	-	-	150	41.9	278.90
32-33	-	75	-	-	-	-	-	-	-	-	-	-	-	75	22.6	301.00
33-34	-	225	300	150	75	-	-	-	-	-	-	-	-	751	259.6	345.65
34-35	-	-	348	376	-	546	-	-	-	-	-	-	-	1270	497.0	391.50
35-36	-	-	-	826	1072	1119	-	-	-	-	-	-	-	3017	1273.3	422.01
36-37	-	-	-	376	143	-	300	-	-	-	-	-	-	819	391.7	478.34
37-38	-	-	-	676	-	381	-	-	-	-	-	-	-	1057	496.9	470.10
38-39	-	-	-	-	526	286	524	-	-	-	-	-	-	1335	680.5	509.62
39-40	-	-	-	-	-	-	-	571	300	-	-	476	-	1348	726.1	538.63
40-41	-	-	-	-	-	-	-	-	476	504	-	-	-	980	625.9	638.72
41-42	-	-	-	-	-	-	-	361	190	-	-	238	-	789	520.3	659.08
42-43	-	-	-	-	-	-	150	-	-	286	-	-	-	436	308.5	707.62
44-45	-	-	-	-	-	-	-	-	-	-	95	-	-	95	77.7	815.90
TSN(1000)	4878	451	649	2479	1815	2332	974	932	967	789	95	714	202392	219468	-	-
TSB(1000 kg)	388.3	141.5	234.3	1098.3	759.8	1029.5	516.0	534.1	582.0	535.0	77.7	434.7	11410.8	-	17742.2	-
Mean length (cm)	21.06	32.00	33.54	35.30	35.86	35.46	38.00	39.77	39.89	40.72	44.00	39.67	19.25	-	-	-
Mean weight (g)	79.61	314.02	361.24	443.12	418.54	441.51	529.52	572.93	601.78	677.66	815.90	608.55	56.38	-	-	80.84

Variable: Abundance

EstLayer: 1

Stratum: 84

SpecCat: MAKRELL

	age														
LenGrp	1	4	5	6	7	8	9	10	11	12	14	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
18-19	-	-	-	-	-	-	-	-	-	-	-	2562	2562	102.0	39.80
19-20	-	-	-	-	-	-	-	-	-	-	-	4741	4741	213.2	44.96
20-21	-	-	-	-	-	-	-	-	-	-	-	729	729	39.3	53.95
21-22	65	-	-	-	-	-	-	-	-	-	-	-	65	5.9	90.00
35-36	-	-	568	568	-	-	-	-	-	-	-	-	1135	461.9	406.90
36-37	-	568	1135	568	-	-	-	-	-	-	-	-	2270	1027.2	452.45
37-38	-	568	1703	5675	1135	2838	-	-	-	-	-	-	11919	5739.3	481.54
38-39	-	-	2270	3973	6811	3405	568	-	568	-	-	-	17594	8720.6	495.65
39-40	-	-	2270	568	6243	568	2270	1703	-	568	568	-	14756	7907.3	535.86
40-41	-	-	-	-	1703	1703	-	568	1135	-	-	-	5108	2991.3	585.62
41-42	-	-	-	-	-	1135	568	568	-	-	-	-	2270	1418.0	624.63

42-43	-	-	-	-	-	568	-	-	-	-	-	-	568	411.5	725.00
43-44	-	-	-	-	568	-	-	568	-	-	-	-	1135	819.8	722.25
TSN(1000)	65	1135	7946	11351	16459	10216	3405	3405	1703	568	568	8032	64852	-	-
TSB(1000 kg)	5.9	543.7	3878.0	5388.0	8798.9	5427.8	1846.5	2069.2	923.8	317.3	303.6	354.5	-	29857.1	-
Mean length (cm)	21.00	36.50	37.57	37.30	38.69	38.67	39.17	40.17	39.33	39.00	39.00	18.77	-	-	-
Mean weight (g)	90.00	479.00	488.06	474.68	534.60	531.31	542.23	607.63	542.57	559.00	535.00	44.13	-	-	460.39

Variable: Abundance

EstLayer: 1

Stratum: 85

SpecCat: MAKRELL

	age														
LenGrp	1	2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	412	412	-	-	-	-	-	-	-	-	-	-	824	161.6	196.00
28-29	-	2885	-	-	-	-	-	-	-	-	-	-	2885	644.7	223.43
29-30	-	-	-	4122	-	-	-	-	-	-	-	-	4122	1022.3	248.00
30-31	-	2061	10744	-	-	-	-	-	-	-	-	-	12805	3523.7	275.18
31-32	-	6595	9122	2473	-	-	-	-	-	-	-	-	18191	5501.0	302.41
32-33	-	-	7880	37549	-	-	-	-	-	-	-	-	45430	14505.2	319.29
33-34	-	-	5677	15634	1303	2175	-	-	-	-	-	-	24790	8487.7	342.39
34-35	-	4722	-	36493	15069	15890	-	9444	-	-	-	-	81618	29761.5	364.64
35-36	-	-	-	-	-	-	-	-	-	91188	-	-	91188	37167.4	407.59
36-37	-	-	-	4968	23101	14469	12656	-	5875	-	-	-	61068	26245.9	429.78
37-38	-	-	1042	2085	2172	9926	7296	1042	-	-	-	-	23563	10955.8	464.96
38-39	-	-	-	-	-	-	-	-	26998	-	-	-	26998	12347.0	457.33
39-40	-	-	-	-	-	-	-	22942	-	-	-	-	22942	12403.0	540.62
40-41	-	-	-	-	-	-	-	-	-	8999	-	-	8999	5002.5	555.88
41-42	-	-	-	-	-	-	-	1110	1110	1110	-	-	3329	2101.1	631.20
42-43	-	-	-	-	-	-	-	1110	-	1110	1110	-	3329	2218.0	666.33
43-44	-	-	-	-	-	-	-	-	-	4561	-	4561	9122	6654.5	729.50
TSN(1000)	412	16676	34466	103325	41645	42459	19952	35648	33982	106967	1110	4561	441203	-	-
TSB(1000 kg)	84.9	4925.4	10686.0	35524.8	17084.6	17564.8	8934.0	17364.8	15522.0	47257.2	666.9	3087.8	-	178703.1	-
Mean length (cm)	27.00	31.11	31.43	33.01	35.23	35.33	36.37	37.77	37.75	35.90	42.00	43.00	-	-	-
Mean weight (g)	206.00	295.35	310.05	343.81	410.25	413.69	447.78	487.12	456.77	441.79	601.00	677.00	-	-	405.04

Variable: Abundance

EstLayer: 1

Stratum: 86

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	1585	-	-	-	-	-	-	-	-	-	1585	385.2	243.00
29-30	1585	686	793	-	-	-	-	-	-	-	3064	777.4	253.73
30-31	-	-	5829	-	-	-	-	-	-	-	5829	1594.0	273.48
31-32	-	6368	7134	-	-	-	-	-	-	-	13502	4020.5	297.76
32-33	-	-	-	22455	-	-	-	-	-	-	22455	7173.4	319.46
33-34	-	4610	7780	-	9004	-	-	-	-	-	21395	7434.7	347.50
34-35	-	-	6801	15306	2718	-	-	-	-	-	24825	9501.6	382.74
35-36	-	-	-	17008	-	-	-	-	-	-	17008	7077.7	416.14
36-37	-	-	1210	2058	3924	1235	81	605	-	-	9113	4122.6	452.40
37-38	-	-	-	1210	630	686	-	605	-	-	3131	1398.2	446.54
38-39	-	-	-	-	-	-	6181	-	-	-	6181	3111.2	503.31
39-40	-	-	-	-	-	-	-	-	-	2582	2582	1389.3	538.08
40-41	-	-	-	-	605	605	-	-	605	-	1815	1052.1	579.67
41-42	-	-	-	-	-	-	-	630	-	-	630	337.8	536.00
42-43	-	-	-	-	-	-	630	-	605	-	1235	695.1	562.78
TSN(1000)	3171	11665	29546	58037	16882	2526	6892	1840	1210	2582	134351	-	-
TSB(1000 kg)	795.0	3562.1	9831.8	21578.0	6582.5	1238.9	3478.8	888.3	726.0	1389.3	-	50070.8	-
Mean length (cm)	28.50	31.67	32.17	33.65	34.26	37.23	38.34	38.04	41.00	39.00	-	-	-
Mean weight (g)	250.75	305.37	332.76	371.80	389.92	490.43	504.72	482.74	600.00	538.08	-	-	372.69

Variable: Abundance

EstLayer: 1

Stratum: 87

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	1772	-	-	-	-	-	-	-	1772	313.6	177.00
27-28	10286	12058	-	-	-	-	-	-	22345	4332.0	193.87
28-29	-	42917	-	-	-	-	-	-	42917	8738.9	203.62
29-30	-	-	94580	-	-	-	-	-	94580	22103.5	233.70

30-31 |	-	46129	76989	13486	-	-	-	-	136604	36321.0	265.89
31-32 |	-	-	154746	74429	-	-	-	-	229174	65318.7	285.02
32-33 |	-	-	81272	83344	-	-	-	-	164616	51714.7	314.15
33-34 |	-	-	-	13830	-	105478	-	-	119308	41190.0	345.24
34-35 |	-	-	-	26600	45029	-	-	-	71629	27060.4	377.78
35-36 |	-	-	-	-	-	69307	-	-	69307	27920.3	402.85
36-37 |	-	-	-	-	12414	3721	3721	3721	23578	9762.5	414.04
37-38 |	-	-	-	-	9943	3721	-	-	13664	6362.6	465.64
38-39 |	-	-	-	-	4971	1772	3721	-	10464	5385.1	514.61
39-40 |	-	-	-	-	-	-	-	3721	3721	1756.5	472.00
TSN(1000) |	12058	101105	407587	211688	72357	184000	7443	7443	1003682	-	-
TSB(1000 kg) |	2326.9	23256.6	112445.2	65969.0	28731.8	68617.4	3587.5	3345.6	-	308279.9	-
Mean length (cm) |	26.85	28.79	30.55	31.84	35.03	33.94	37.00	37.50	-	-	-
Mean weight (g) |	192.97	230.03	275.88	311.63	397.08	372.92	482.00	449.50	-	-	307.15

Variable: Abundance

EstLayer: 1

Stratum: 88

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22 |	1394	-	-	-	-	-	-	-	-	1394	121.8	87.33
22-23 |	6785	-	-	-	-	-	-	-	-	6785	634.5	93.52
23-24 |	15910	-	-	-	-	-	-	-	-	15910	1642.3	103.23
24-25 |	28721	-	-	-	-	-	-	-	-	28721	3334.2	116.09
25-26 |	35746	-	-	-	-	-	-	-	-	35746	4560.3	127.58
26-27 |	57896	-	-	-	-	-	-	-	-	57896	8259.1	142.65
27-28 |	175	32359	-	-	-	-	-	-	-	32533	5439.3	167.19
28-29 |	-	65559	-	-	-	-	-	-	-	65559	13077.0	199.47
29-30 |	-	45930	23688	622	-	-	-	-	-	70241	15332.8	218.29
30-31 |	-	13374	106528	15792	-	-	-	-	-	135694	33114.5	244.04
31-32 |	-	1466	79446	1389	-	-	-	-	-	82301	21494.4	261.17
32-33 |	-	9795	140013	28569	1244	-	-	-	-	179621	52600.6	292.84
33-34 |	-	-	52679	20667	17867	2176	-	-	-	93389	29210.1	312.78
34-35 |	-	-	1410	8130	835	39483	-	-	-	49858	16851.8	338.00
35-36 |	-	-	-	1860	27312	-	8519	-	-	37691	13801.1	366.16
36-37 |	-	-	-	16441	1145	-	-	-	-	17586	6150.7	349.75
37-38 |	-	-	-	-	-	1202	-	-	-	1202	524.7	436.51
38-39 |	-	-	-	-	-	8185	-	-	-	8185	3800.0	464.28

39-40	|	-	-	-	-	-	-	-	-	1661	1661	856.2	515.56
40-41	|	-	-	-	-	-	-	310	317	-	627	359.6	573.84
TSN(1000)	|	146627	168483	403764	93470	48403	51046	8829	317	1661	922599	-	-
TSB(1000 kg)	|	18580.3	35291.6	109345.2	28762.4	16698.0	18135.4	3290.5	205.3	856.2	-	231165.0	-
Mean length (cm)	|	24.81	28.50	31.24	32.79	34.19	34.67	35.18	40.00	39.00	-	-	-
Mean weight (g)	|	126.72	209.47	270.81	307.72	344.98	355.28	372.71	648.00	515.56	-	-	250.56

Variable: Abundance

EstLayer: 1

Stratum: 99

SpecCat: MAKRELL

LenGrp	age	2	3	4	5	6	7	8	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	|	4894	-	-	-	-	-	-	-	4894	1633.2	333.74
33-34	|	4787	4488	-	-	-	-	-	-	9275	3342.7	360.42
34-35	|	18764	-	-	-	8034	-	-	-	26797	10419.5	388.83
35-36	|	-	-	7328	15126	12180	14958	-	-	49592	21854.9	440.69
36-37	|	-	-	26712	43032	-	-	-	-	69744	33354.5	478.24
37-38	|	-	-	1623	14639	3652	28997	-	-	48910	24426.9	499.43
38-39	|	-	-	6732	18610	23506	-	-	-	48847	27635.8	565.76
39-40	|	-	-	8547	4805	12821	6411	4274	748	37606	22171.5	589.57
40-41	|	-	-	-	-	-	3994	12821	-	16815	10706.3	636.71
41-42	|	-	-	9359	406	-	-	-	-	9765	5721.8	585.97
42-43	|	-	-	-	-	-	2543	-	-	2543	1833.2	721.00
43-44	|	-	-	-	-	-	-	-	2137	2137	1524.7	713.50
TSN(1000)	|	28444	4488	60302	96617	60192	56902	17095	2885	326925	-	-
TSB(1000 kg)	|	10475.3	1625.0	30444.2	48510.1	31509.7	29165.9	10941.9	1953.0	-	164624.9	-
Mean length (cm)	|	33.49	33.00	37.33	36.55	37.01	37.13	39.75	41.96	-	-	-
Mean weight (g)	|	368.28	362.07	504.86	502.09	523.48	512.56	640.06	676.97	-	-	503.56

Variable: Abundance

EstLayer: 1

Stratum: 100

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	11	12	13	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
6-7	-	-	-	-	-	-	-	-	-	-	-	-	1010	1010	35.3	35.00
30-31	-	14	-	-	-	-	-	-	-	-	-	-	-	14	3.3	237.00
31-32	-	129	538	524	-	-	-	-	-	-	-	-	-	1190	351.9	295.77
32-33	-	5918	-	-	4225	-	-	-	-	-	-	-	-	10144	3333.1	328.58
33-34	3035	-	21860	5204	-	-	-	-	-	-	-	-	-	30099	10743.2	356.93
34-35	-	10690	16868	22837	11602	22958	2002	-	-	-	-	-	-	86957	34253.4	393.91
35-36	-	-	5693	81188	74123	20647	11839	-	-	-	-	-	-	193491	82965.4	428.78
36-37	-	-	365	19387	103600	103173	44832	3639	42	-	-	-	-	275039	128577.4	467.49
37-38	-	-	8955	10464	43071	66580	51823	10734	-	-	-	-	-	191626	99763.2	520.62
38-39	-	-	-	-	34178	4228	61859	16	17910	-	-	-	-	118191	64634.1	546.86
39-40	-	-	-	3547	9041	6274	34556	6420	28878	-	-	-	-	88717	52764.1	594.75
40-41	-	-	-	-	4389	5193	26871	14533	3621	-	-	-	-	54607	34432.9	630.56
41-42	-	-	-	-	-	-	3784	14078	8399	-	-	-	-	26261	17734.4	675.30
42-43	-	-	-	-	-	16	-	1010	3188	5138	1580	-	-	10932	7598.4	695.07
43-44	-	-	-	-	-	-	-	-	-	-	141	2225	-	2366	1777.3	751.24
44-45	-	-	-	-	-	-	-	2150	-	1010	-	-	-	3160	2347.4	742.95
45-46	-	-	-	-	-	-	3160	-	-	-	-	-	-	3160	2770.1	876.74
TSN(1000)	3035	16751	54278	143152	284230	229069	240725	52579	62038	6148	1721	2225	1010	1096962	-	-
TSB(1000 kg)	1078.7	6314.8	21567.2	61782.2	136242.0	110316.6	130668.1	31310.0	37587.6	4467.4	1050.7	1664.4	35.3	-	544085.0	-
Mean length (cm)	33.00	33.27	34.18	35.13	36.15	36.21	37.74	39.46	39.19	42.33	42.08	43.00	6.00	-	-	-
Mean weight (g)	355.42	376.99	397.35	431.58	479.34	481.59	542.81	595.48	605.88	726.67	610.55	747.97	35.00	-	-	495.99

Variable: Abundance

EstLayer: 1

Stratum: 103

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	-	16	-	-	-	-	-	-	-	-	-	16	4.4	270.00
32-33	127	78	78	-	-	-	-	-	-	-	-	284	93.8	330.64
33-34	16	95	16	-	-	-	-	-	-	-	-	127	42.9	337.89
34-35	222	-	-	251	-	-	-	-	-	-	-	473	179.9	380.41
35-36	459	565	205	-	-	-	-	-	-	-	-	1230	480.6	390.76
36-37	-	-	676	816	395	-	-	-	-	-	-	1887	806.3	427.32
37-38	-	-	67	770	791	-	-	-	-	-	-	1629	776.8	476.98

38-39	-	-	-	1022	132	-	-	51	-	-	-	1204	615.7	511.32
39-40	-	-	-	-	551	429	-	-	-	-	-	980	553.7	564.78
40-41	-	-	-	-	-	1008	-	-	-	-	-	1008	649.4	644.06
41-42	-	-	-	-	-	-	441	-	-	-	-	441	295.9	671.46
42-43	-	-	-	-	-	-	-	-	16	95	-	111	79.8	720.19
43-44	-	-	-	-	-	-	-	16	-	-	-	16	11.4	706.50
44-45	-	-	-	-	-	-	-	-	-	-	16	16	13.2	815.90
TSN(1000)	824	754	1043	2860	1869	1437	441	67	16	95	16	9422	-	-
TSB(1000 kg)	313.4	274.2	461.2	1358.5	883.1	892.4	295.9	32.3	12.0	67.8	13.2	-	4603.9	-
Mean length (cm)	34.23	34.31	35.52	36.81	37.45	39.70	41.00	39.21	42.00	42.00	44.00	-	-	-
Mean weight (g)	380.23	363.50	442.33	474.94	472.52	620.89	671.46	483.26	741.00	716.63	815.90	-	-	488.63

Variable: Abundance

EstLayer: 1

Stratum: 104

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	14	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
18-19	-	-	-	-	-	-	-	-	-	-	-	-	-	426	426	18.1	42.40
19-20	-	-	-	-	-	-	-	-	-	-	-	-	-	5398	5398	263.6	48.83
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	2670	2670	151.4	56.71
21-22	170	-	-	-	-	-	-	-	-	-	-	-	-	-	170	13.2	77.70
31-32	-	-	33	33	-	-	-	-	-	-	-	-	-	-	66	20.2	308.30
32-33	-	1909	737	2706	-	-	-	-	-	-	-	-	-	-	5352	1673.6	312.72
33-34	-	94	2181	5361	2110	704	-	-	-	-	-	-	-	-	10450	3506.6	335.56
34-35	-	-	-	-	29106	-	-	-	-	-	-	-	-	-	29106	11176.0	383.97
35-36	-	-	-	45854	-	-	-	-	-	-	-	-	-	-	45854	19246.5	419.73
36-37	-	-	-	-	63394	-	-	-	-	-	-	-	-	-	63394	27622.0	435.72
37-38	-	-	-	-	12305	31455	-	-	-	-	-	-	-	-	43760	20900.8	477.63
38-39	-	-	-	-	15611	11440	-	6896	-	-	-	-	-	-	33947	16974.4	500.03
39-40	-	-	-	1909	1909	928	8233	4047	3538	2031	136	-	123	-	22853	12985.0	568.20
40-41	-	-	-	-	-	10806	-	-	-	-	-	-	-	-	10806	6407.8	592.99
41-42	-	-	-	-	42	-	2655	4580	1909	123	-	94	-	-	9402	5820.6	619.06

42-43	-	-	-	-	-	-	-	-	-	-	1938	-	-	-	1938	1370.6	707.27
43-44	-	-	-	-	-	-	-	-	-	58	-	29	29	-	117	75.4	645.58
44-45	-	-	-	-	-	-	-	-	-	-	-	42	-	-	42	31.6	743.50
TSN(1000)	170	2002	2950	55863	124477	55332	10888	15523	5446	2213	2074	165	152	8494	285750	-	-
TSB(1000 kg)	13.2	653.0	969.0	22962.1	54191.8	27719.0	6513.3	8742.0	3194.2	1228.8	1440.5	113.8	83.6	433.0	-	128257.3	-
Mean length (cm)	21.00	32.05	32.73	34.80	35.88	37.78	39.49	39.15	39.70	39.22	41.80	42.12	39.77	19.26	-	-	-
Mean weight (g)	77.70	326.13	328.44	411.04	435.36	500.95	598.20	563.15	586.50	555.37	694.59	688.69	550.14	50.98	-	-	448.84

Variable: Abundance

EstLayer: 1

Stratum: 105

SpecCat: MAKRELL

	age									
LenGrp	4	5	6	7	8	9	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	374	-	-	-	-	-	-	374	102.6	274.50
31-32	3689	-	-	-	-	-	-	3689	1129.3	306.14
32-33	8926	9657	-	-	-	-	-	18583	6031.3	324.56
33-34	-	43211	-	-	-	-	-	43211	15355.4	355.36
34-35	64640	-	-	-	14344	-	-	78984	28914.9	366.09
35-36	-	-	92121	-	-	-	-	92121	37661.4	408.83
36-37	-	61478	-	-	-	-	-	61478	26093.8	424.44
37-38	-	-	-	14832	13053	-	-	27886	12946.2	464.26
38-39	-	-	-	-	8059	-	-	8059	3950.8	490.25
39-40	-	-	-	-	-	-	4942	4942	2681.5	542.60
40-41	-	442	1578	2485	-	-	-	4504	2519.3	559.32
41-42	-	-	-	2681	-	451	-	3132	1995.4	637.15
42-43	-	1372	-	-	-	-	-	1372	852.3	621.00
TSN(1000)	77628	116160	93699	19998	35456	451	4942	348334	-	-
TSB(1000 kg)	27895.3	45635.2	38522.3	10182.4	15030.0	287.5	2681.5	-	140234.3	-
Mean length (cm)	33.61	34.64	35.08	37.91	36.01	41.00	39.00	-	-	-
Mean weight (g)	359.35	392.86	411.13	509.17	423.91	638.00	542.60	-	-	402.59

Variable: Abundance

EstLayer: 1

Stratum: 106

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
24-25	23	-	-	-	-	-	-	-	-	-	23	2.9	126.00
25-26	1134	-	-	-	-	-	-	-	-	-	1134	160.7	141.64
26-27	2712	-	-	-	-	-	-	-	-	-	2712	451.4	166.44
27-28	-	45	-	-	-	-	-	-	-	-	45	8.5	188.50
28-29	-	4911	-	-	-	-	-	-	-	-	4911	1065.4	216.93
29-30	-	7561	-	-	-	-	-	-	-	-	7561	1745.9	230.91
30-31	-	3428	14416	-	-	-	-	-	-	-	17844	4774.6	267.58
31-32	-	631	23424	5912	-	-	-	-	-	-	29967	8725.1	291.16
32-33	-	-	21306	21352	162	-	-	-	-	-	42820	13730.3	320.65
33-34	-	-	9124	4003	26964	-	-	-	-	-	40091	13552.3	338.04
34-35	-	-	5809	9880	9897	1457	-	3422	-	-	30465	11151.6	366.04
35-36	-	-	2802	-	10285	17880	-	-	-	-	30967	11995.6	387.37
36-37	-	-	-	-	-	3817	9654	-	-	-	13471	5787.5	429.64
37-38	-	-	-	-	-	3863	2073	-	-	-	5936	2663.1	448.64
38-39	-	-	-	-	-	439	-	-	-	-	439	188.9	430.00
39-40	-	-	-	-	-	70	-	70	-	-	139	78.8	566.50
40-41	-	-	-	-	-	-	-	439	-	-	439	228.8	521.00
41-42	-	-	-	-	-	-	-	436	27	-	463	324.2	700.90
42-43	-	-	-	-	-	-	-	70	-	-	70	38.6	555.00
44-45	-	-	-	-	-	-	-	-	-	381	381	316.5	831.00
TSN(1000)	3870	16576	76881	41146	47308	27526	11726	4436	27	381	229878	-	-
TSB(1000 kg)	615.0	3930.2	23741.1	13518.9	16747.9	11202.8	5010.2	1890.4	18.0	316.5	-	76990.8	-
Mean length (cm)	25.69	28.98	31.70	32.43	33.64	35.42	36.18	35.49	41.00	44.00	-	-	-
Mean weight (g)	158.92	237.10	308.80	328.55	354.02	406.99	427.25	426.13	667.00	831.00	-	-	334.92

Variable: Abundance

EstLayer: 1

Stratum: 107

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)

LenGrp		1	2	3	4	5	6	7	8	9	10	14	Number	Biomass	Mean W
23-24	|	10727	-	-	-	-	-	-	-	-	-	-	10727	1072.7	100.00
24-25	|	34199	-	-	-	-	-	-	-	-	-	-	34199	3861.2	112.90
25-26	|	57671	-	-	-	-	-	-	-	-	-	-	57671	7297.3	126.53
26-27	|	38450	-	-	-	-	-	-	-	-	-	-	38450	5454.4	141.86
27-28	|	5364	2922	-	-	-	-	-	-	-	-	-	8286	1326.1	160.04
28-29	|	-	25560	-	-	-	-	-	-	-	-	-	25560	4883.8	191.07
29-30	|	-	26274	11721	-	-	-	-	-	-	-	-	37994	8375.6	220.44
30-31	|	-	6056	33568	133	-	-	-	-	-	-	-	39757	9684.3	243.59
31-32	|	-	25548	59420	12535	-	-	-	-	-	-	-	97503	26586.5	272.67
32-33	|	-	178	105392	23592	4171	-	-	-	-	-	-	133333	38985.9	292.40
33-34	|	-	-	26584	70810	18861	2713	-	-	-	-	-	118968	38973.0	327.59
34-35	|	-	-	1809	55743	9852	-	-	-	-	-	-	67403	23841.0	353.71
35-36	|	-	-	-	-	73305	2891	-	-	-	-	-	76196	29415.1	386.05
36-37	|	-	-	-	1900	28415	4171	10093	-	-	-	-	44578	19006.2	426.36
37-38	|	-	-	-	-	-	23096	-	-	-	-	-	23096	10685.7	462.67
38-39	|	-	-	-	-	-	-	5363	2018	-	-	-	7381	4003.3	542.38
39-40	|	-	-	-	-	-	5364	904	2019	5364	-	-	13650	7571.6	554.70
40-41	|	-	-	-	-	-	-	-	-	-	-	904	904	472.7	523.00
41-42	|	-	-	-	-	-	-	-	-	2019	-	-	2019	1051.7	521.00
42-43	|	-	-	-	-	-	-	-	-	-	5363	-	5363	4011.2	748.00
TSN(1000)	|	146411	86538	238494	164713	134603	38234	16359	4037	7382	5363	904	843036	-	-
TSB(1000 kg)	|	18516.9	19509.1	66900.9	54400.2	51213.0	17587.1	7548.1	2307.1	4092.9	4011.2	472.7	-	246559.2	-
Mean length (cm)	|	24.96	29.30	31.45	33.08	34.76	36.74	36.82	38.50	39.55	42.00	40.00	-	-	-
Mean weight (g)	|	126.47	225.44	280.51	330.27	380.47	459.99	461.40	571.50	554.42	748.00	523.00	-	-	292.47

Variable: Abundance

EstLayer: 1

Stratum: 108

SpecCat: MAKRELL

		age													
LenGrp		1	2	3	4	5	6	7	8	9	10	14	Number	Biomass	Mean W
													(1E3)	(1E3kg)	(g)
22-23	|	21	-	-	-	-	-	-	-	-	-	-	21	2.3	105.00
23-24	|	64	-	-	-	-	-	-	-	-	-	-	64	6.8	105.33
24-25	|	298	-	-	-	-	-	-	-	-	-	-	298	35.8	120.13
25-26	|	240	-	-	-	-	-	-	-	-	-	-	240	30.4	126.34
26-27	|	697	-	-	-	-	-	-	-	-	-	-	697	101.0	144.94
28-29	|	-	219	-	-	-	-	-	-	-	-	-	219	42.1	192.00
29-30	|	-	800	-	416	-	-	-	-	-	-	-	1216	267.9	220.35
30-31	|	-	1084	1523	2323	-	-	-	-	-	-	-	4930	1212.6	245.94

31-32	-	1533	5407	854	438	-	-	-	-	-	-	8232	2258.5	274.34
32-33	-	64	10149	4650	657	-	-	-	-	-	-	15520	4666.4	300.67
33-34	-	876	7444	3723	2323	638	-	-	-	-	-	15003	4957.8	330.46
34-35	-	-	481	1365	12192	2533	-	-	-	-	-	16571	5915.8	356.99
35-36	-	-	-	214	6614	3943	-	-	-	-	-	10772	4201.0	390.00
36-37	-	-	-	-	3681	1686	-	638	-	-	-	6005	2487.9	414.29
37-38	-	-	-	-	438	1584	1494	-	-	-	-	3516	1681.7	478.35
38-39	-	-	-	-	-	-	251	-	645	-	-	895	397.4	443.82
39-40	-	-	-	-	-	-	219	841	-	-	-	1060	577.5	544.84
40-41	-	-	-	-	-	481	-	-	-	-	-	481	284.6	592.20
41-42	-	-	-	-	-	-	-	-	-	417	32	449	234.7	523.09
42-43	-	-	-	-	-	-	-	219	-	-	-	219	159.0	725.00
43-44	-	-	-	-	-	-	-	-	-	417	417	833	551.9	662.50
TSN(1000)	1322	4576	25004	13545	26343	10866	1963	1698	645	833	449	87243	-	-
TSB(1000 kg)	176.3	1196.7	7512.7	4165.7	9730.0	4400.0	980.1	855.7	269.2	452.3	334.2	-	30072.9	-
Mean length (cm)	25.16	30.67	32.00	32.03	34.39	35.32	37.35	38.26	38.00	42.00	42.86	-	-	-
Mean weight (g)	133.38	261.52	300.46	307.54	369.36	404.94	499.20	503.85	417.63	543.00	744.98	-	-	344.70

Variable: Abundance

EstLayer: 1

Stratum: 109

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22	88	-	-	-	-	-	-	-	-	-	88	7.5	85.00
22-23	264	-	-	-	-	-	-	-	-	-	264	26.4	100.00
23-24	709	-	-	-	-	-	-	-	-	-	709	74.0	104.38
24-25	442	-	-	-	-	-	-	-	-	-	442	50.9	115.20
25-26	3717	-	-	-	-	-	-	-	-	-	3717	468.4	126.00
26-27	88	-	-	-	-	-	-	-	-	-	88	14.5	164.00
29-30	-	-	88	88	-	-	-	-	-	-	176	37.9	215.00
30-31	-	-	-	115	-	-	-	-	-	-	115	32.2	280.00
31-32	-	347	13541	-	-	-	-	-	-	-	13888	4047.2	291.42
32-33	-	5575	29155	178	-	-	-	-	-	-	34908	10795.2	309.25
33-34	-	-	9154	24135	9291	-	-	-	-	-	42580	14640.7	343.84
34-35	-	-	3717	8564	7264	6862	-	-	-	-	26407	9858.2	373.31
35-36	-	-	-	17516	12785	10776	-	-	-	-	41077	16452.7	400.54
36-37	-	-	-	-	382	1857	13361	-	-	-	15599	6811.2	436.64
37-38	-	-	-	-	7780	3717	469	-	-	-	11966	5918.4	494.61

38-39	-	-	-	-	-	-	-	2293	-	-	2293	1160.6	506.19
39-40	-	-	-	-	-	-	-	-	4153	-	4153	2537.1	610.89
40-41	-	-	-	-	-	-	116	116	116	-	348	218.6	628.67
41-42	-	-	-	-	-	-	-	1858	-	-	1858	1391.5	749.00
42-43	-	-	-	-	-	-	-	3716	-	-	3716	2773.7	746.50
43-44	-	-	-	-	-	-	-	-	-	1858	1858	1319.0	710.00
TSN(1000)	5310	5922	55656	50595	37500	23212	13946	7982	4269	1858	206250	-	-
TSB(1000 kg)	641.7	1831.9	17420.0	18769.6	15035.5	9498.0	6106.5	5397.8	2615.8	1319.0	-	78636.0	-
Mean length (cm)	24.45	31.94	32.05	33.84	34.74	35.10	36.07	40.59	39.03	43.00	-	-	-
Mean weight (g)	120.87	309.36	312.99	370.98	400.95	409.19	437.86	676.23	612.74	710.00	-	-	381.27

Variable: Abundance

EstLayer: 1

Stratum: 119

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	62	-	-	-	-	-	-	-	62	24.9	404.60
35-36	-	62	-	1883	-	-	-	-	1945	685.5	352.48
36-37	-	14574	-	62	-	-	-	-	14635	6730.5	459.88
37-38	17306	-	-	-	-	-	-	-	17306	8386.4	484.59
38-39	-	-	19189	62	-	-	-	-	19251	10005.2	519.72
39-40	-	-	3643	11841	-	-	-	-	15484	8493.9	548.54
40-41	-	1822	-	911	2733	6376	-	1822	13663	7992.1	584.95
41-42	-	-	-	-	-	-	5465	-	5465	3132.0	573.08
42-43	-	-	-	-	3643	-	-	-	3643	2330.9	639.75
TSN(1000)	17368	16457	22833	14758	6376	6376	5465	1822	91455	-	-
TSB(1000 kg)	8411.3	7817.9	11892.8	7837.7	3872.1	3670.9	3132.0	1146.6	-	47781.3	-
Mean length (cm)	36.99	36.44	38.16	38.53	41.14	40.00	41.00	40.00	-	-	-
Mean weight (g)	484.31	475.05	520.86	531.07	607.30	575.74	573.08	629.40	-	-	522.46

Variable: Abundance

EstLayer: 1

Stratum: 120

SpecCat: MAKRELL

LenGrp	age 3	7	8	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	21	-	-	-	21	8.4	398.60
38-39	-	21	-	-	21	11.6	550.80
39-40	-	16	16	-	32	19.4	611.50
43-44	-	21	-	16	37	27.6	748.06
TSN(1000)	21	58	16	16	111	-	-
TSB(1000 kg)	8.4	36.7	9.9	12.0	-	66.9	-
Mean length (cm)	34.00	40.09	39.00	43.00	-	-	-
Mean weight (g)	398.60	634.53	620.50	755.40	-	-	605.11

Variable: Abundance

EstLayer: 1

Stratum: 121

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	86	-	-	-	-	-	-	-	-	-	86	24.8	287.00
34-35	-	-	1354	-	86	-	-	-	-	-	1441	549.2	381.16
35-36	-	-	1066	-	2795	-	-	-	-	-	3862	1607.5	416.28
36-37	-	-	7549	-	692	-	432	-	-	-	8674	3689.9	425.40
37-38	-	346	-	7664	519	-	-	692	-	-	9221	4194.1	454.83
38-39	-	-	6569	-	2421	692	-	-	-	-	9682	4784.3	494.13
39-40	-	1095	2737	-	3141	-	-	-	-	-	6973	3716.6	532.96
40-41	-	-	-	2737	-	2190	-	-	865	-	5792	3039.7	524.80
41-42	-	-	-	-	-	2449	1181	3832	-	-	7463	4724.3	633.04
42-43	-	-	-	1642	-	259	-	-	-	-	1902	1235.6	649.70
43-44	-	-	-	-	547	-	-	-	-	86	634	426.8	673.21
TSN(1000)	86	1441	19277	12044	10202	5591	1614	4524	865	86	55731	-	-
TSB(1000 kg)	24.8	730.8	8803.6	6044.1	5038.0	3098.8	875.6	2827.7	486.3	63.3	-	27993.0	-
Mean length (cm)	33.00	38.52	36.91	38.36	37.53	40.28	39.66	40.39	40.00	43.00	-	-	-
Mean weight (g)	287.00	507.18	456.69	501.84	493.81	554.28	542.54	625.02	562.17	731.50	-	-	502.29

Variable: Abundance

EstLayer: 1

Stratum: 122

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	11	12	14	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
6-7	-	-	-	-	-	-	-	-	-	-	-	-	49	49	2.0	41.00
33-34	287	-	-	-	-	-	-	-	-	-	-	-	-	287	110.4	384.70
34-35	94	-	-	81	-	-	-	-	-	-	-	-	-	175	67.4	384.76
35-36	-	-	1445	502	94	-	-	-	-	-	-	-	-	2041	827.1	405.15
36-37	-	440	1015	797	608	304	-	600	-	-	-	-	-	3763	1637.9	435.24
37-38	-	-	-	1290	1052	2039	-	-	-	-	-	-	-	4380	2082.8	475.48
38-39	-	-	-	184	48	5770	1242	98	-	98	-	-	-	7440	3641.6	489.46
39-40	-	-	-	437	477	934	772	28	1077	98	-	-	-	3823	2091.9	547.21
40-41	-	-	-	94	-	3882	426	155	-	194	-	-	-	4751	2663.1	560.58
41-42	-	-	-	-	-	28	1585	1193	-	-	1258	-	-	4064	2520.1	620.15
42-43	-	-	-	-	-	-	1068	-	-	-	-	-	-	1068	686.3	642.64
43-44	-	-	-	-	-	239	-	-	239	-	49	31	-	556	405.8	729.54
44-45	-	-	-	-	-	-	477	-	-	33	-	-	-	510	347.6	681.94
45-46	-	-	-	-	-	239	-	-	-	-	-	-	-	239	193.9	812.90
TSN(1000)	381	440	2460	3384	2280	13433	5569	2074	1315	423	1307	31	49	33145	-	-
TSB(1000 kg)	146.1	185.1	1051.4	1575.2	1048.0	6983.4	3342.9	1091.1	757.6	238.2	835.0	21.8	2.0	-	17277.8	-
Mean length (cm)	33.25	36.00	35.41	36.79	37.09	38.67	40.43	39.31	39.73	39.61	41.07	43.00	6.00	-	-	-
Mean weight (g)	383.62	420.56	427.33	465.49	459.75	519.85	600.26	526.18	576.03	562.90	639.12	712.50	41.00	-	-	521.28

Variable: Abundance

EstLayer: 1

Stratum: 123

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	-	71	-	-	-	-	-	-	-	-	-	71	20.7	289.90
32-33	1150	-	-	-	-	-	-	-	-	-	-	1150	296.2	257.70
33-34	-	2812	-	-	-	-	-	-	-	-	-	2812	949.6	337.67
34-35	-	3921	-	6129	-	-	-	-	-	-	-	10049	3707.0	368.88

LenGrp	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	-	677	7519	16120	3169	428	248	-	-	-	-	28161	11081.9	393.51
36-37	-	-	9015	14462	4062	428	226	-	-	-	-	28192	12213.5	433.22
37-38	-	-	2983	836	8240	4194	-	397	-	-	-	16650	7739.6	464.84
38-39	-	-	214	1452	4726	890	1398	677	-	-	-	9358	4814.9	514.55
39-40	-	-	-	1856	323	4262	1557	-	-	-	-	7998	4469.2	558.78
40-41	-	-	-	1705	487	-	-	-	-	-	-	2192	1284.9	586.12
41-42	-	-	-	-	220	597	-	-	-	-	-	817	525.9	644.00
42-43	-	-	-	-	50	-	-	-	71	476	50	646	391.7	606.13
43-44	-	-	-	-	-	-	-	-	50	-	-	50	35.4	713.50
TSN(1000)	1150	7482	19732	42559	21277	10798	3429	1074	121	476	50	108146	-	-
TSB(1000 kg)	296.2	2730.6	8501.0	18152.7	9733.1	5352.6	1811.6	558.8	82.1	275.6	36.2	-	47530.5	-
Mean length (cm)	32.00	33.69	35.79	35.71	36.89	37.97	38.11	37.63	42.41	42.00	42.00	-	-	-
Mean weight (g)	257.70	364.96	430.83	426.53	457.45	495.71	528.32	520.26	679.59	579.25	729.50	-	-	439.50

Variable: Abundance

EstLayer: 1

Stratum: 124

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	287	53	-	-	-	-	-	-	-	-	-	340	105.3	309.87
32-33	-	1362	-	1842	-	-	-	-	-	-	-	3204	931.4	290.68
33-34	-	6801	7459	1450	-	-	-	-	-	-	-	15710	5592.4	355.98
34-35	15397	211	8359	12560	427	-	427	-	-	-	-	37381	14293.2	382.37
35-36	-	8123	5385	21859	6232	1216	811	-	-	-	-	43625	17735.3	406.53
36-37	-	-	2579	20991	2040	-	-	-	-	-	-	25610	11371.6	444.03
37-38	-	-	-	189	6805	5144	1524	-	-	-	-	13661	6163.4	451.15
38-39	-	-	2757	-	4414	-	-	516	-	-	-	7687	3829.1	498.12
39-40	-	-	-	436	875	2185	875	-	875	-	875	6120	3254.3	531.73
40-41	-	-	-	-	780	257	-	389	-	-	389	1816	1041.0	573.24
41-42	-	-	-	-	-	-	-	-	304	-	-	304	210.6	693.90
42-43	-	-	-	-	-	-	-	-	-	340	-	340	228.7	672.77
TSN(1000)	15683	16550	26539	59328	21573	8803	3636	905	1178	340	1264	155798	-	-
TSB(1000 kg)	5991.2	6335.5	10614.3	24316.2	9687.6	4089.4	1676.5	454.4	607.3	228.7	755.2	-	64756.3	-
Mean length (cm)	33.95	33.91	34.53	35.04	36.66	37.31	36.68	38.86	39.52	42.00	39.31	-	-	-
Mean weight (g)	382.01	382.81	399.95	409.86	449.07	464.57	461.08	501.95	515.51	672.77	597.50	-	-	415.64

Variable: Abundance

EstLayer: 1

Stratum: 125

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	447	-	-	-	-	-	-	-	-	-	-	447	88.5	198.00
29-30	-	450	-	-	-	-	-	-	-	-	-	450	106.5	236.89
30-31	-	741	-	-	-	-	-	-	-	-	-	741	186.4	251.60
31-32	443	886	-	-	-	-	-	-	-	-	-	1329	373.3	280.89
32-33	-	2126	-	1277	-	-	-	-	-	-	-	3402	1122.6	329.95
33-34	-	1788	481	2835	1444	-	-	-	-	-	-	6550	2367.1	361.41
34-35	-	295	2346	9323	3818	482	-	-	-	-	-	16265	6435.4	395.67
35-36	-	482	1889	3640	12272	4810	-	-	-	-	-	23093	9742.4	421.88
36-37	-	-	941	8465	5455	3001	-	-	-	-	-	17861	8020.1	449.04
37-38	-	-	-	964	592	5122	964	-	1446	-	-	9089	4396.0	483.65
38-39	-	-	-	-	-	931	-	5450	-	-	-	6381	3306.4	518.20
39-40	-	-	-	-	-	1445	-	156	-	-	-	1601	855.8	534.62
40-41	-	-	-	-	463	-	-	-	-	-	-	463	268.4	579.57
41-42	-	-	-	-	-	-	-	1270	-	-	-	1270	802.0	631.51
42-43	-	-	-	-	-	-	-	-	-	-	965	965	674.6	699.00
43-44	-	-	-	-	-	-	-	-	147	-	-	147	91.8	624.00
44-45	-	-	-	-	-	-	-	-	-	156	-	156	128.3	825.00
TSN(1000)	890	6768	5657	26503	24044	15792	964	6875	1593	156	965	90207	-	-
TSB(1000 kg)	214.5	2130.8	2290.9	10873.9	10169.6	7488.4	454.1	3710.6	829.8	128.3	674.6	-	38965.6	-
Mean length (cm)	29.49	32.02	34.58	34.68	35.09	36.35	37.00	38.58	37.55	44.00	42.00	-	-	-
Mean weight (g)	240.98	314.83	405.00	410.29	422.95	474.20	471.00	539.70	520.82	825.00	699.00	-	-	431.96

Variable: Abundance

EstLayer: 1

Stratum: 126

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)

	1	2	3	4	5	6	7	8	9	10	11	12			
26-27	31	-	-	-	-	-	-	-	-	-	-	-	31	4.8	154.00
28-29	-	31	-	-	-	-	-	-	-	-	-	-	31	7.0	226.00
29-30	-	31	31	-	-	-	-	-	-	-	-	-	62	14.5	233.50
30-31	-	130	137	-	-	-	-	-	-	-	-	-	267	70.9	265.63
31-32	-	62	62	-	-	-	-	-	-	-	-	-	124	33.4	268.50
32-33	-	31	273	192	-	-	-	-	-	-	-	-	496	155.5	313.59
33-34	-	-	75	68	627	-	-	-	-	-	-	-	769	272.1	353.71
34-35	-	-	-	559	1272	62	-	-	-	-	-	-	1893	695.4	367.39
35-36	-	-	-	354	1715	2162	354	-	-	-	-	-	4586	1869.7	407.75
36-37	-	-	-	-	1287	1770	-	-	966	-	-	-	4023	1759.5	437.36
37-38	-	-	-	-	-	37	37	2090	-	-	-	-	2165	1031.6	476.61
38-39	-	-	-	-	-	161	-	161	-	-	-	-	321	170.3	530.00
39-40	-	-	-	-	-	-	-	1447	-	-	-	-	1447	775.2	535.56
40-41	-	-	-	-	-	161	-	-	161	-	161	-	482	277.1	575.00
41-42	-	-	-	-	-	-	-	-	-	161	-	161	321	205.6	640.00
TSN(1000)	31	286	578	1173	4901	4353	391	3698	1126	161	161	161	17019	-	-
TSB(1000 kg)	4.8	73.3	171.9	429.1	1941.8	1909.0	162.4	1850.9	500.3	110.5	93.7	95.1	-	7342.8	-
Mean length (cm)	26.00	30.11	31.39	33.92	34.75	35.70	35.19	37.83	36.57	41.00	40.00	41.00	-	-	-
Mean weight (g)	154.00	256.72	297.69	365.89	396.21	438.53	414.95	500.48	444.26	688.00	583.00	592.00	-	-	431.45

Variable: Abundance

EstLayer: 1

Stratum: 127

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
24-25	38	-	-	-	-	-	-	-	-	-	-	-	38	4.9	130.00
28-29	-	37	-	-	-	-	-	-	-	-	-	-	37	7.9	211.00
29-30	-	-	-	2174	-	-	-	-	-	-	-	-	2174	581.2	267.33
30-31	-	-	3244	-	-	-	-	-	-	-	-	-	3244	871.3	268.62
31-32	-	-	7403	-	136	-	-	-	-	-	-	-	7540	2276.3	301.91
32-33	-	659	23402	2305	8022	-	-	-	-	-	-	-	34387	10943.7	318.25
33-34	-	-	14256	3131	20555	-	24	-	-	-	-	-	37967	13440.3	354.00
34-35	-	-	2497	12772	32971	16126	-	-	-	-	-	-	64367	24446.3	379.80
35-36	-	-	1319	4475	49489	1217	10198	-	-	-	-	-	66697	27922.9	418.65
36-37	-	-	-	-	31110	13044	9806	-	-	-	-	-	53961	23699.7	439.20
37-38	-	-	-	6871	-	-	3814	4276	-	-	-	-	14961	7026.5	469.66
38-39	-	-	-	-	-	2568	2252	4618	-	-	-	-	9438	4776.3	506.07
39-40	-	-	-	-	-	-	7415	-	130	851	-	-	8397	4640.3	552.63

LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
40-41	-	-	-	-	-	-	-	1071	-	-	783	-	1854	1100.4	593.41
42-43	-	-	-	-	-	-	-	-	-	-	-	746	746	495.2	664.00
44-45	-	-	-	-	-	-	-	-	-	-	-	105	105	89.9	853.00
TSN(1000)	38	697	52121	31727	142283	32956	33510	9965	130	851	783	851	305912	-	-
TSB(1000 kg)	4.9	220.4	17087.3	12310.0	56576.4	13713.6	15830.8	4907.0	74.2	537.1	476.1	585.1	-	122323.0	-
Mean length (cm)	24.00	31.79	32.18	34.20	34.53	35.14	36.61	37.79	39.00	39.00	40.00	42.25	-	-	-
Mean weight (g)	130.00	316.37	327.84	388.00	397.63	416.12	472.42	492.42	570.05	631.00	607.81	687.40	-	-	399.86

Variable: Abundance

EstLayer: 1

Stratum: 128

SpecCat: MAKRELL

LenGrp (age)	1	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	35	-	-	-	-	-	-	-	-	-	35	3.8	109.00
29-30	-	35	-	-	-	-	-	-	-	-	35	8.6	247.00
30-31	-	-	291	-	-	-	-	-	-	-	291	78.6	270.36
31-32	-	-	6076	69	-	-	-	-	-	-	6145	1794.7	292.05
32-33	-	-	4892	4823	35	-	-	-	-	-	9749	3153.4	323.45
33-34	-	3870	6557	11163	617	513	-	-	-	-	22721	7866.4	346.22
34-35	-	35	69	6659	13436	33	-	-	-	-	20232	7508.3	371.10
35-36	-	-	-	291	12183	11157	1027	-	-	-	24658	10103.1	409.73
36-37	-	-	-	35	2570	9656	-	-	-	-	12260	5448.0	444.36
37-38	-	-	-	-	3830	3456	2205	3082	-	-	12573	6030.7	479.67
38-39	-	-	-	-	-	-	5375	770	770	-	6915	3595.1	519.88
39-40	-	-	-	-	-	-	-	-	4159	-	4159	2457.2	590.82
40-41	-	-	-	-	-	-	-	-	-	1473	1473	895.7	608.20
41-42	-	-	-	-	-	-	-	-	-	1473	1473	1008.1	684.49
TSN(1000)	35	3939	17885	23040	32671	24815	8607	3852	4929	2946	122718	-	-
TSB(1000 kg)	3.8	1339.7	5744.2	8043.8	13357.4	10612.7	4209.8	1847.0	2889.5	1903.8	-	49951.7	-
Mean length (cm)	23.00	32.97	32.00	33.10	34.86	35.62	37.39	37.20	38.84	40.50	-	-	-
Mean weight (g)	109.00	340.07	321.18	349.12	408.85	427.68	489.12	479.47	586.21	646.34	-	-	407.04

Variable: Abundance

EstLayer: 1

Stratum: 140

SpecCat: MAKRELL

LenGrp		age 3	4	5	6	7	8	9	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	|	347	347	-	-	-	-	-	-	-	693	240.4	346.70
34-35	|	-	-	-	1040	-	-	-	-	-	1040	384.2	369.47
35-36	|	-	5546	-	-	-	-	-	-	-	5546	2131.6	384.33
36-37	|	-	-	166	-	166	2939	5200	-	-	8470	3704.0	437.30
37-38	|	-	-	1733	2592	-	829	3120	-	-	8274	4157.1	502.41
38-39	|	-	-	-	2427	2411	-	-	-	-	4838	2290.4	473.43
39-40	|	-	-	-	1040	2592	166	1040	-	-	4838	2641.2	545.94
40-41	|	-	-	-	-	497	-	-	1733	-	2231	1312.7	588.50
41-42	|	-	-	-	-	678	-	-	-	-	678	432.3	637.45
42-43	|	-	-	166	-	-	-	512	-	-	678	499.1	735.92
43-44	|	-	-	-	-	-	-	-	-	693	693	418.1	603.00
TSN(1000)	|	347	5893	2065	7099	6345	3934	9872	1733	693	37980	-	-
TSB(1000 kg)	|	122.9	2249.2	1038.3	3402.0	3364.5	1836.3	4779.6	1000.4	418.1	-	18211.1	-
Mean length (cm)	|	33.00	34.88	37.32	37.20	38.83	36.34	36.94	40.00	43.00	-	-	-
Mean weight (g)	|	354.40	381.66	502.86	479.24	530.26	466.83	484.16	577.18	603.00	-	-	479.49

Variable: Abundance

EstLayer: 1

Stratum: 143

SpecCat: MAKRELL

LenGrp		age 3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	|	197	36	36	-	-	-	-	-	269	103.5	384.71
34-35	|	-	148	185	148	185	-	-	-	664	267.5	402.78
35-36	|	-	124	657	384	186	-	-	-	1351	572.0	423.38
36-37	|	-	-	-	411	-	337	-	-	748	331.8	443.50
37-38	|	-	-	435	-	-	149	187	-	771	377.4	489.48
38-39	|	-	-	-	-	298	-	-	-	298	154.2	517.13
39-40	|	-	-	-	-	-	-	-	124	124	63.9	514.00
40-41	|	-	-	-	-	-	-	-	275	275	143.1	520.84
41-42	|	-	-	-	-	-	36	-	-	36	27.0	746.00
42-43	|	-	-	-	-	-	38	-	-	38	27.9	741.00

TSN(1000)	197	308	1313	943	668	560	187	399	4574	-	-
TSB(1000 kg)	74.5	125.4	586.3	399.5	308.4	277.0	90.0	207.0	-	2068.2	-
Mean length (cm)	33.00	34.29	35.47	35.28	36.06	36.99	37.00	39.69	-	-	-
Mean weight (g)	378.90	407.11	446.66	423.55	461.48	494.95	482.40	518.71	-	-	452.13

Variable: Abundance

EstLayer: 1

Stratum: 145

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1111	-	-	-	-	-	-	-	-	-	1111	260.5	234.50
31-32	-	6312	-	-	-	-	-	-	-	-	6312	2083.0	330.00
32-33	-	45842	-	-	-	-	-	-	-	-	45842	15025.7	327.77
33-34	-	4955	44192	-	-	-	-	-	-	-	49147	17095.3	347.84
34-35	-	-	26358	71102	46955	-	-	-	-	-	144416	56002.9	387.79
35-36	-	-	31315	43389	78511	12626	-	-	-	-	165841	68131.2	410.82
36-37	-	-	-	52162	46706	71654	-	-	-	-	170521	73490.5	430.98
37-38	-	-	-	-	22807	53269	552	-	-	-	76629	36216.6	472.62
38-39	-	-	-	-	-	-	3305	-	-	-	3305	1736.8	525.50
39-40	-	-	-	-	-	14281	-	1655	-	-	15936	9315.8	584.57
40-41	-	-	-	-	-	6314	-	-	-	-	6314	4053.3	642.00
41-42	-	-	-	-	-	-	-	-	550	-	550	375.6	683.00
44-45	-	-	-	-	-	-	-	-	-	550	550	387.7	705.00
TSN(1000)	1111	57109	101865	166654	194979	158143	3857	1655	550	550	686473	-	-
TSB(1000 kg)	260.5	18882.0	38788.7	67471.7	81415.6	73702.5	1984.3	906.5	375.6	387.7	-	284175.0	-
Mean length (cm)	30.00	31.98	33.87	34.89	35.23	36.69	37.86	39.00	41.00	44.00	-	-	-
Mean weight (g)	234.50	330.63	380.79	404.86	417.56	466.05	514.40	547.67	683.00	705.00	-	-	413.96

Variable: Abundance

EstLayer: 1

Stratum: 148

SpecCat: MAKRELL

age

LenGrp		2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	|	986	986	-	-	-	-	-	-	-	1972	539.3	273.50
31-32	|	5916	2114	-	-	-	-	-	-	-	8030	2442.9	304.24
32-33	|	1972	18912	269	-	-	-	-	-	-	21153	6828.8	322.82
33-34	|	-	6224	23261	1972	-	-	-	-	-	31457	11009.6	349.99
34-35	|	-	-	11653	6353	2509	-	-	-	-	20515	8020.5	390.96
35-36	|	-	-	13084	15744	-	-	-	-	-	28829	12180.3	422.51
36-37	|	-	-	2805	8952	7094	208	-	-	-	19059	8357.5	438.50
37-38	|	-	-	-	3009	-	4713	-	-	-	7722	3726.0	482.53
38-39	|	-	-	-	-	688	3437	-	-	-	4126	2163.9	524.50
39-40	|	-	-	-	-	-	-	833	537	-	1371	775.9	566.02
40-41	|	-	-	-	-	-	1194	-	-	416	1611	965.2	599.29
41-42	|	-	-	-	-	-	418	-	-	-	418	277.7	665.00
TSN(1000)	|	8874	28235	51072	36030	10292	9971	833	537	416	146261	-	-
TSB(1000 kg)	|	2680.0	9177.4	19636.2	15209.1	4413.2	5151.6	470.6	305.2	244.0	-	57287.5	-
Mean length (cm)	|	31.11	32.08	33.90	35.13	35.65	37.85	39.00	39.00	40.00	-	-	-
Mean weight (g)	|	302.00	325.04	384.48	422.13	428.82	516.68	564.75	568.00	586.00	-	-	391.68

Variable: Abundance

EstLayer: 1

Stratum: 162

SpecCat: MAKRELL

LenGrp	age	2	3	4	5	6	7	8	9	10	12	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	|	-	69	-	-	-	-	-	-	-	-	-	69	22.2	321.00
32-33	|	66	-	131	-	-	-	-	-	-	-	-	197	68.6	348.67
33-34	|	-	267	134	-	-	-	-	-	-	-	-	401	153.7	383.67
34-35	|	-	-	-	593	537	56	-	-	-	-	-	1187	472.8	398.36
35-36	|	-	-	56	313	801	56	-	-	-	-	-	1227	508.1	414.18
36-37	|	-	-	-	56	856	389	56	-	-	-	-	1358	603.6	444.54
37-38	|	-	-	-	-	658	134	56	-	-	-	-	848	391.4	461.38
38-39	|	-	-	-	56	180	-	56	403	-	-	-	695	350.7	504.73
39-40	|	-	-	-	-	266	-	-	56	56	-	-	378	211.0	557.45
40-41	|	-	-	-	-	-	56	-	-	69	-	-	125	66.0	525.96
41-42	|	-	-	-	-	-	-	-	66	-	-	-	66	34.2	521.00
42-43	|	-	-	-	-	-	-	135	-	-	56	-	191	132.7	694.77
43-44	|	-	-	-	-	-	-	-	-	-	-	56	56	33.9	603.00

TSN(1000)	66	336	321	1019	3298	692	304	525	125	56	56	6798	-	-
TSB(1000 kg)	20.9	125.3	119.9	414.0	1461.1	322.3	172.5	271.8	67.7	39.3	33.9	-	3048.9	-
Mean length (cm)	32.00	32.59	32.94	34.64	35.98	36.27	39.22	38.48	39.55	42.00	43.00	-	-	-
Mean weight (g)	319.00	372.63	373.72	406.36	443.01	465.74	568.24	518.11	539.87	699.00	603.00	-	-	448.50

Variable: Abundance

EstLayer: 1

Stratum: 164

SpecCat: MAKRELL

	age											
LenGrp	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	169	-	-	-	-	-	-	-	-	169	55.3	327.50
32-33	228	-	84	-	-	-	-	-	-	313	106.0	338.68
33-34	494	381	-	-	-	-	-	-	-	875	319.2	364.72
34-35	-	1761	421	337	-	-	-	-	-	2518	984.8	391.02
35-36	-	1034	4300	2347	-	-	-	-	-	7682	3208.4	417.67
36-37	-	-	2764	4023	-	1720	-	-	-	8506	3717.5	437.03
37-38	-	-	574	2824	337	574	-	-	-	4309	1982.9	460.12
38-39	-	-	-	2172	-	-	-	-	-	2172	1053.0	484.81
39-40	-	-	-	-	-	360	-	468	-	828	439.1	530.53
40-41	-	-	-	-	-	84	-	-	192	276	153.1	554.51
41-42	-	-	-	84	84	-	84	-	-	253	152.7	603.00
TSN(1000)	891	3176	8143	11788	422	2738	84	468	192	27902	-	-
TSB(1000 kg)	313.2	1259.8	3460.7	5317.1	209.2	1227.1	45.3	236.4	103.2	-	12171.9	-
Mean length (cm)	32.36	34.21	35.40	36.39	37.80	36.73	41.00	39.00	40.00	-	-	-
Mean weight (g)	351.51	396.62	424.99	451.06	496.25	448.15	536.00	505.55	538.00	-	-	436.24

Variable: Abundance

EstLayer: 1

Stratum: 166

SpecCat: MAKRELL

	age								
LenGrp	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)

32-33	547	-	-	-	-	-	-	547	188.7	345.00
33-34	-	-	2880	-	-	-	-	2880	988.2	343.18
34-35	2835	4376	3282	-	-	-	-	10492	4139.9	394.57
35-36	916	4923	10814	1641	-	-	-	18295	7572.9	413.94
36-37	2736	7358	12423	547	1094	-	-	24158	10957.0	453.55
37-38	-	5403	5467	-	-	-	-	10870	5215.0	479.74
38-39	-	-	2098	7248	3102	-	-	12448	6258.9	502.80
39-40	-	-	-	-	3194	-	1554	4748	2624.3	552.73
40-41	-	-	-	-	2418	-	777	3195	1879.1	588.12
41-42	-	-	-	-	-	547	230	777	524.4	674.84
42-43	-	-	-	-	-	-	547	547	364.8	667.00
TSN(1000)	7034	22060	36963	9436	9808	547	3108	88957	-	-
TSB(1000 kg)	2907.1	9694.5	16094.0	4468.2	5301.8	358.3	1889.2	-	40713.0	-
Mean length (cm)	34.75	35.63	35.56	37.36	38.60	41.00	39.93	-	-	-
Mean weight (g)	413.30	439.46	435.40	473.51	540.54	655.00	607.89	-	-	457.67

IESSNS 2012. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 65

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	5039	-	-	-	-	-	5039	502.4	99.69
23-24	17304	6789	-	-	-	-	24093	2571.2	106.72
24-25	33327	-	-	-	-	-	33327	3930.6	117.94
25-26	-	21603	-	-	-	-	21603	3066.9	141.96
26-27	-	38945	-	-	-	-	38945	6069.0	155.84
27-28	-	41178	-	-	-	-	41178	7255.9	176.21
28-29	-	25576	-	-	-	-	25576	4792.1	187.37
29-30	-	10567	-	-	-	-	10567	2112.3	199.91
30-31	-	-	485	-	-	-	485	125.0	258.00
31-32	-	-	871	-	-	-	871	232.1	266.43
32-33	-	-	1454	1454	-	-	2908	822.4	282.83
33-34	-	-	-	1840	-	-	1840	547.1	297.26
34-35	-	-	-	1258	871	-	2129	727.3	341.63

35-36	-	-	-	-	-	969	969	379.4	391.50
36-37	-	-	-	387	-	871	1258	467.0	371.29
TSN(1000)	55670	144659	2810	4939	871	1840	210789	-	-
TSB(1000 kg)	6307.8	23992.6	762.3	1521.5	312.0	704.6	-	33600.7	-
Mean length (cm)	23.51	26.57	31.34	33.20	34.00	35.47	-	-	-
Mean weight (g)	113.31	165.86	271.31	308.09	358.13	382.83	-	-	159.41

Variable: Abundance

EstLayer: 1

Stratum: 67

SpecCat: MAKRELL

	age											
LenGrp	1	2	3	4	5	6	7	9	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	1246	1246	89.7	72.00
21-22	20246	-	-	-	-	-	-	-	-	20246	1673.5	82.65
22-23	57269	-	-	-	-	-	-	-	-	57269	5071.2	88.55
23-24	65995	15182	-	-	-	-	-	-	-	81177	8352.3	102.89
24-25	34570	-	-	-	-	-	-	-	-	34570	4280.8	123.83
25-26	-	60150	-	-	-	-	-	-	-	60150	8559.6	142.30
26-27	-	198696	-	-	-	-	-	-	-	198696	29915.1	150.56
27-28	-	377000	-	-	-	-	-	-	-	377000	61972.1	164.38
28-29	-	312039	-	-	-	-	-	-	-	312039	57126.6	183.08
29-30	-	186478	-	-	-	-	-	-	-	186478	37298.2	200.01
30-31	-	-	68354	6378	-	-	-	-	-	74731	16688.3	223.31
31-32	-	-	51859	-	-	-	-	-	-	51859	12901.4	248.78
32-33	-	-	30877	8725	-	-	-	-	-	39602	10895.6	275.12
33-34	-	-	-	40678	-	-	-	-	-	40678	11886.8	292.21
34-35	-	-	-	10169	4783	-	-	-	-	14953	5003.2	334.61
35-36	-	-	-	-	-	-	37640	-	-	37640	14008.8	372.18
36-37	-	-	-	-	-	4783	-	-	-	4783	1734.7	362.67
37-38	-	-	-	-	-	17124	-	-	-	17124	6842.6	399.59
38-39	-	-	-	-	-	-	-	9500	-	9500	3296.5	347.00
TSN(1000)	178080	1149544	151089	65951	4783	21908	37640	9500	1246	1619742	-	-
TSB(1000 kg)	17834.5	196414.9	36364.6	19480.1	1530.7	8577.4	14008.8	3296.5	89.7	-	297597.0	-
Mean length (cm)	22.65	27.27	30.75	32.73	34.00	36.78	35.00	38.00	20.00	-	-	-
Mean weight (g)	100.15	170.86	240.68	295.37	320.00	391.53	372.18	347.00	72.00	-	-	183.73

Variable: Abundance

EstLayer: 1

Stratum: 69

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	9	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	56867	-	-	-	-	-	-	-	-	-	56867	4974.6	87.48
23-24	81914	-	-	-	-	-	-	-	-	-	81914	7870.2	96.08
24-25	126257	-	-	-	-	-	-	-	-	-	126257	13581.6	107.57
25-26	83459	-	-	-	-	-	-	-	-	-	83459	9769.9	117.06
26-27	38590	31293	-	-	-	-	-	-	-	-	69882	9926.1	142.04
27-28	-	110016	-	-	-	-	-	-	-	-	110016	16887.5	153.50
28-29	-	70900	-	-	-	-	-	-	-	-	70900	11968.1	168.80
29-30	-	89669	-	-	-	-	-	-	-	-	89669	16180.7	180.45
30-31	-	7297	11472	-	-	-	-	-	-	-	18769	3968.1	211.42
31-32	-	3649	4175	-	-	-	-	-	-	-	7823	1834.9	234.55
32-33	-	-	-	3649	-	-	-	-	-	-	3649	875.6	240.00
33-34	-	-	-	3649	-	-	-	-	-	-	3649	1032.5	283.00
34-35	-	-	-	11998	4175	4175	-	-	-	-	20347	6238.7	306.61
35-36	-	-	-	-	-	-	-	4175	-	-	4175	1544.6	370.00
36-37	-	-	-	-	-	4175	-	-	-	-	4175	1440.2	345.00
37-38	-	-	-	-	-	-	3649	-	-	-	3649	1350.0	370.00
38-39	-	-	-	-	-	-	-	-	23470	-	23470	9759.5	415.84
42-43	-	-	-	-	-	-	-	-	-	3649	3649	1645.5	451.00
TSN(1000)	387086	312824	15646	19295	4175	8349	3649	4175	23470	3649	782317	-	-
TSB(1000 kg)	41559.3	51821.5	3581.1	5608.7	1269.1	2709.3	1350.0	1544.6	9759.5	1645.5	-	120848.6	-
Mean length (cm)	23.91	27.82	30.27	33.43	34.00	35.00	37.00	35.00	38.00	42.00	-	-	-
Mean weight (g)	107.36	165.66	228.88	290.68	304.00	324.50	370.00	370.00	415.84	451.00	-	-	154.48

Variable: Abundance

EstLayer: 1

Stratum: 81

SpecCat: MAKRELL

LenGrp	age 4	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)

34-35	32	-	32	8.2	253.90
40-41	-	32	32	14.8	460.40
TSN(1000)	32	32	64	-	-
TSB(1000 kg)	8.2	14.8	-	23.0	-
Mean length (cm)	34.00	40.00	-	-	-
Mean weight (g)	253.90	460.40	-	-	357.15

Variable: Abundance

EstLayer: 1

Stratum: 82

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	60	-	-	-	-	-	-	-	-	-	-	60	11.8	196.00
30-31	60	60	-	-	-	-	-	-	-	-	-	120	23.6	196.05
31-32	-	2270	-	-	-	-	-	-	-	-	-	2270	650.2	286.37
32-33	981	6448	1101	-	-	-	-	-	-	-	-	8531	2703.9	316.97
33-34	-	6873	3687	1596	1161	-	-	-	-	-	-	13317	4751.4	356.78
34-35	-	1287	11737	616	3197	-	-	-	-	-	-	16838	6408.1	380.58
35-36	-	-	2520	4176	4556	2699	925	-	-	-	-	14876	6084.7	409.04
36-37	-	-	981	2819	1966	1778	-	-	-	-	-	7544	3384.0	448.59
37-38	-	-	-	-	3195	1322	1472	-	-	-	-	5989	2998.4	500.69
38-39	-	-	-	120	89	301	551	60	-	60	-	1181	567.4	480.64
39-40	-	-	-	-	491	120	525	-	120	-	-	1256	648.2	516.05
40-41	-	-	-	-	-	-	308	-	-	-	-	308	175.8	570.31
41-42	-	-	-	-	-	-	551	-	-	-	-	551	309.7	562.40
42-43	-	-	-	-	248	-	-	-	-	-	551	799	549.4	687.85
43-44	-	-	-	-	-	-	60	-	60	-	-	120	81.2	675.75
TSN(1000)	1101	16939	20027	9327	14903	6219	4391	60	180	60	551	73758	-	-
TSB(1000 kg)	323.4	5541.9	7661.1	3963.0	6364.1	2701.0	2243.1	26.6	103.6	32.3	387.6	-	29347.7	-
Mean length (cm)	31.73	32.42	33.93	34.93	35.46	35.93	37.74	38.00	40.33	38.00	42.00	-	-	-
Mean weight (g)	293.65	327.17	382.54	424.89	427.04	434.29	510.84	442.40	574.53	538.00	704.00	-	-	397.89

Variable: Abundance

EstLayer: 1

Stratum: 83

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	2067	-	-	-	-	-	-	-	-	-	-	2067	337.1	163.08
28-29	4134	-	-	-	-	-	-	-	-	-	-	4134	762.7	184.50
29-30	1611	-	-	-	-	-	-	-	-	-	-	1611	409.1	254.00
30-31	912	-	-	-	-	-	-	-	-	-	-	912	194.3	213.00
31-32	-	4134	-	-	-	-	-	-	-	-	-	4134	1123.6	271.80
32-33	5288	-	-	-	-	-	-	-	-	-	-	5288	1458.0	275.70
33-34	-	1369	3193	8054	-	-	-	-	-	-	-	12616	4456.8	353.27
34-35	-	-	11703	13798	1611	-	-	-	-	-	-	27112	9957.4	367.27
35-36	-	912	16321	11247	17019	8510	1611	-	-	-	-	55621	22076.4	396.91
36-37	-	-	1611	6443	19301	9664	2737	-	-	-	-	39756	16970.9	426.88
37-38	-	-	3221	15167	2067	2737	6443	-	-	-	-	29635	13439.8	453.51
38-39	-	-	-	1369	2737	4832	456	-	-	-	-	9394	4564.9	485.93
39-40	-	-	-	-	-	2523	456	2737	3221	-	-	8938	4671.6	522.67
40-41	-	-	-	912	-	-	1369	-	-	-	456	2737	1502.3	548.83
41-42	-	-	-	-	912	912	-	-	-	-	-	1825	1107.5	606.90
42-43	-	-	-	-	-	-	-	456	-	-	-	456	301.3	660.50
45-46	-	-	-	-	-	-	-	-	-	456	-	456	337.1	739.00
TSN(1000)	14012	6415	36050	56989	43647	29179	13072	3193	3221	456	456	206692	-	-
TSB(1000 kg)	3161.2	1900.6	13855.0	23169.0	18454.8	13144.4	5967.3	1633.8	1795.6	337.1	251.8	-	83670.8	-
Mean length (cm)	29.61	32.00	34.72	35.27	35.81	36.55	36.96	39.43	39.00	45.00	40.00	-	-	-
Mean weight (g)	225.60	296.28	384.33	406.55	422.82	450.48	456.50	511.61	557.40	739.00	552.00	-	-	404.81

Variable: Abundance

EstLayer: 1

Stratum: 84

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	5630	-	-	-	-	-	-	-	-	-	-	-	-	5630	1083.4	192.42
29-30	5219	-	-	-	-	-	-	-	-	-	-	-	-	5219	1094.1	209.61
30-31	1587	2221	645	-	-	-	-	-	-	-	-	-	-	4453	1093.4	245.54

31-32	|	3021	8660	-	-	-	-	-	-	-	-	-	-	-	11680	3258.5	278.97
32-33	|	777	15235	8226	3665	-	-	-	-	-	-	-	-	-	27903	8502.1	304.70
33-34	|	-	19089	22020	2998	2376	-	-	-	-	-	-	-	-	46483	15595.1	335.50
34-35	|	1942	15710	32670	19210	777	-	-	-	-	-	-	-	-	70309	26519.1	377.18
35-36	|	-	8540	11694	11304	19808	7128	2387	-	-	-	-	-	-	60861	24344.8	400.00
36-37	|	-	-	13552	27314	19210	11433	2397	-	-	-	-	-	-	73907	31324.2	423.83
37-38	|	-	-	2397	3687	19243	11124	777	-	-	-	-	-	-	37228	17243.9	463.20
38-39	|	-	-	1199	7272	1934	10245	1199	1220	42	-	42	-	-	23153	11088.4	478.92
39-40	|	-	-	-	7149	2323	793	6057	2419	-	3702	-	-	-	22442	11252.9	501.41
40-41	|	-	-	-	42	-	169	2440	2419	4262	-	21	-	21	9374	5487.5	585.38
41-42	|	-	-	21	-	21	21	2419	106	42	42	21	-	-	2694	1468.6	545.20
42-43	|	-	-	-	-	-	-	85	-	21	42	-	42	-	190	127.5	669.63
43-44	|	-	-	-	-	-	-	-	21	63	21	21	-	-	127	89.5	705.08
45-46	|	-	-	-	-	-	-	-	-	-	1199	-	-	-	1199	885.8	739.00
TSN(1000)	|	18177	69455	92424	82642	65692	40913	17760	6184	4431	5006	106	42	21	402854	-	-
TSB(1000 kg)	|	4250.3	23350.7	33711.6	35184.6	28393.6	18532.6	8449.8	3271.0	2526.3	2685.1	59.8	31.6	11.8	-	160458.8	-
Mean length (cm)	|	29.77	32.91	34.11	35.59	36.03	36.68	38.33	39.24	40.04	40.50	40.00	42.00	40.00	-	-	-
Mean weight (g)	|	233.83	336.20	364.75	425.75	432.22	452.98	475.78	528.95	570.12	536.34	565.58	746.00	556.20	-	-	398.31

Variable: Abundance

EstLayer: 1

Stratum: 85

SpecCat: MAKRELL

LenGrp	age	1	2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	|	-	307	-	-	-	-	-	-	-	-	-	307	30.6	99.50
24-25	|	768	-	-	-	-	-	-	-	-	-	-	768	89.6	116.60
25-26	|	-	6810	-	-	-	-	-	-	-	-	-	6810	1076.6	158.09
26-27	|	-	34260	-	-	-	-	-	-	-	-	-	34260	5573.6	162.69
27-28	|	-	68812	-	-	-	-	-	-	-	-	-	68812	12460.2	181.08
28-29	|	-	78710	-	-	-	-	-	-	-	-	-	78710	15297.4	194.35
29-30	|	-	34955	6756	-	3863	-	-	-	-	-	-	45574	9931.5	217.92
30-31	|	-	15650	11381	4418	-	-	-	-	-	-	-	31449	7837.7	249.22
31-32	|	-	8179	11845	2240	-	-	-	-	-	-	-	22264	6197.6	278.37
32-33	|	-	1359	9251	22776	-	829	5785	2717	-	-	-	42717	12644.9	296.01
33-34	|	-	-	18203	35628	13676	4195	584	-	-	-	-	72287	24935.8	344.96
34-35	|	-	-	1412	7526	39149	21752	-	1412	-	-	-	71251	27182.9	381.51
35-36	|	-	-	5999	8665	15353	38804	8365	1767	-	-	-	78954	32599.7	412.90
36-37	|	-	-	1397	-	12538	24159	7696	2859	-	-	-	48650	21386.0	439.59

37-38	-	-	-	-	12446	7648	-	13937	-	-	-	34031	17101.5	502.52
38-39	-	-	-	-	1158	2117	9632	1158	169	-	169	14403	7146.4	496.19
39-40	-	-	-	-	-	-	7681	342	4568	-	-	12591	6701.0	532.22
40-41	-	-	-	-	-	-	-	8677	-	-	-	8677	4684.3	539.88
41-42	-	-	-	-	-	-	-	5314	591	-	-	5905	3438.1	582.22
43-44	-	-	-	-	-	-	-	-	-	1421	-	1421	927.9	653.00
TSN(1000)	768	249041	66244	81255	98183	99505	39743	38182	5328	1421	169	679839	-	-
TSB(1000 kg)	89.6	48327.1	20192.3	26881.7	39415.8	41922.3	17787.4	18878.3	2745.3	927.9	75.5	-	217243.2	-
Mean length (cm)	24.00	27.75	31.85	32.81	34.50	35.13	36.23	37.65	39.19	43.00	38.00	-	-	-
Mean weight (g)	116.60	194.05	304.82	330.83	401.45	421.31	447.57	494.43	515.23	653.00	446.00	-	-	319.55

Variable: Abundance

EstLayer: 1

Stratum: 86

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	11	12	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	8465	-	-	-	-	-	-	-	-	-	-	-	8465	939.6	111.00
23-24	43651	9879	-	-	-	-	-	-	-	-	-	-	53529	6079.8	113.58
24-25	46434	-	-	-	-	-	-	-	-	-	-	-	46434	5595.1	120.50
25-26	-	79476	-	-	-	-	-	-	-	-	-	-	79476	11208.3	141.03
26-27	-	190973	-	-	-	-	-	-	-	-	-	-	190973	30383.4	159.10
27-28	-	242757	-	-	-	-	-	-	-	-	-	-	242757	42578.3	175.39
28-29	1988	191472	-	-	-	-	-	-	-	-	-	-	193460	37920.3	196.01
29-30	-	36268	-	-	-	-	-	-	-	-	-	-	36268	7884.0	217.38
30-31	-	3363	17637	-	-	-	-	-	-	-	-	-	21000	5306.5	252.69
31-32	-	-	-	13535	-	-	-	-	-	-	-	-	13535	4061.9	300.11
32-33	-	-	375	10151	994	-	-	-	-	-	-	-	11520	3345.9	290.43
33-34	-	-	1331	9400	11127	2662	-	751	-	-	-	-	25272	8209.1	324.83
34-35	-	-	-	-	12080	15830	-	-	-	-	-	-	27909	10028.2	359.31
35-36	-	-	-	-	9998	19984	-	2999	-	-	-	-	32981	12934.3	392.17
36-37	-	-	-	-	751	19126	7998	-	-	-	-	-	27875	11431.7	410.11
37-38	-	-	-	-	-	-	6374	5999	-	-	-	-	12373	5692.8	460.11
38-39	-	-	-	-	-	-	3999	-	663	-	-	-	4662	2152.8	461.79
39-40	-	-	-	-	-	-	-	-	-	-	1000	-	1000	511.9	512.00
41-42	-	-	-	-	-	-	-	-	-	-	-	1000	1000	596.9	597.00
42-43	-	-	-	-	-	-	-	-	-	1000	-	-	1000	649.9	650.00
43-44	-	-	-	-	-	-	-	-	-	-	331	-	331	215.7	651.00

TSN(1000)	100538	754188	19343	33086	34950	57602	18371	9749	663	1000	1331	1000	1031820	-	-
TSB(1000 kg)	12027.2	131420.3	5010.8	9959.5	12582.9	22128.9	8142.3	4179.9	300.2	649.9	727.6	596.9	-	207726.2	-
Mean length (cm)	23.48	26.85	30.25	31.88	33.95	34.96	36.78	36.08	38.00	42.00	40.00	41.00	-	-	-
Mean weight (g)	119.63	174.25	259.04	301.02	360.03	384.17	443.20	428.76	453.00	650.00	546.60	597.00	-	-	201.32

Variable: Abundance

EstLayer: 1

Stratum: 87

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	706	-	-	-	-	-	-	-	-	-	-	706	73.5	104.00
23-24	1122	706	-	-	-	-	-	-	-	-	-	1828	208.6	114.09
25-26	-	415	-	-	-	-	-	-	-	-	-	415	62.7	151.00
26-27	-	6272	-	-	-	-	-	-	-	-	-	6272	1052.7	167.83
27-28	-	26587	-	-	2119	-	-	-	-	-	-	28706	5291.5	184.33
28-29	-	34831	-	2119	-	-	-	-	-	-	-	36950	7206.4	195.03
29-30	-	13410	7156	-	-	-	-	-	-	-	-	20566	4513.2	219.44
30-31	-	7797	3731	4238	-	-	-	-	-	-	-	15767	3943.8	250.13
31-32	-	-	5560	14381	-	-	-	-	-	-	-	19941	5505.0	276.07
32-33	-	-	9210	9204	7797	-	-	-	-	-	-	26211	8073.1	308.00
33-34	-	-	-	9948	15595	-	6611	-	-	-	-	32153	10616.0	330.17
34-35	-	-	-	9372	11862	5694	-	-	-	-	-	26928	9585.7	355.98
35-36	-	1122	-	-	1735	21208	-	-	2119	-	-	26184	9840.1	375.80
36-37	-	-	-	992	5198	706	992	-	-	-	-	7888	3139.7	398.05
37-38	-	-	-	-	-	954	-	-	248	-	-	1202	448.0	372.69
38-39	-	-	-	-	-	-	-	-	-	3343	-	3343	1455.8	435.51
39-40	-	-	1547	-	-	-	-	-	-	248	1795	3591	1717.6	478.34
41-42	-	-	-	-	-	-	-	248	-	-	-	248	135.4	546.00
TSN(1000)	1828	91142	27205	50253	44307	28563	7602	248	2367	3591	1795	258900	-	-
TSB(1000 kg)	203.6	18207.6	7711.1	15058.3	14944.7	10750.6	2550.6	135.4	854.3	1572.8	879.4	-	72868.6	-
Mean length (cm)	22.61	27.92	31.13	32.03	33.24	34.89	33.39	41.00	35.21	38.07	39.00	-	-	-
Mean weight (g)	111.38	199.77	283.45	299.65	337.30	376.39	335.50	546.00	360.93	438.03	489.82	-	-	281.45

Variable: Abundance

EstLayer: 1

Stratum: 88

SpecCat: MAKRELL

LenGrp		age 1	2	3	4	5	6	7	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	|	-	-	-	-	-	-	-	677	677	56.2	83.00
22-23	|	1903	-	-	-	-	-	-	-	1903	190.3	100.00
23-24	|	13008	-	-	-	-	-	-	-	13008	1406.5	108.13
24-25	|	22589	-	-	-	-	-	-	-	22589	2662.3	117.86
25-26	|	-	13946	-	-	-	-	-	-	13946	2024.2	145.14
26-27	|	-	85675	-	-	-	-	-	-	85675	13333.6	155.63
27-28	|	-	115378	-	-	-	-	-	-	115378	19798.5	171.60
28-29	|	-	163342	-	-	-	-	-	-	163342	29832.6	182.64
29-30	|	-	54524	-	-	-	-	-	-	54524	11322.3	207.66
30-31	|	-	7058	-	9987	-	-	-	-	17045	3558.8	208.79
31-32	|	-	-	3806	-	-	-	-	-	3806	983.8	258.50
32-33	|	-	-	-	13654	-	-	-	-	13654	3852.0	282.12
33-34	|	-	-	-	12095	-	-	-	-	12095	3711.3	306.85
34-35	|	-	-	3806	3806	4816	3806	-	-	16234	5598.5	344.86
35-36	|	-	-	-	-	7612	-	-	-	7612	2555.7	335.75
36-37	|	-	-	-	-	5709	3262	-	-	8971	3210.9	357.91
37-38	|	-	-	-	-	-	333	1903	-	2236	893.4	399.51
38-39	|	-	-	-	-	-	-	1903	-	1903	865.8	455.00
TSN(1000)	|	37500	439924	7612	39542	18137	7402	3806	677	554599	-	-
TSB(1000 kg)	|	4259.1	77836.5	2249.3	10949.8	6213.1	2663.8	1628.9	56.2	-	105856.8	-
Mean length (cm)	|	23.55	27.41	32.50	31.99	35.05	35.02	37.50	20.00	-	-	-
Mean weight (g)	|	113.58	176.93	295.50	276.92	342.56	359.89	428.00	83.00	-	-	190.87

Variable: Abundance

EstLayer: 1

Stratum: 89

SpecCat: MAKRELL

LenGrp		age 1	2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22	|	2951	-	-	-	-	-	-	-	-	-	-	-	2951	253.8	86.00
22-23	|	45395	-	-	-	-	-	-	-	-	-	-	-	45395	4153.2	91.49
23-24	|	44631	-	-	-	-	-	-	-	-	-	-	-	44631	4550.7	101.96

24-25	|	50761	-	-	-	-	-	-	-	-	-	-	-	50761	5993.5	118.07
25-26	|	-	16112	-	-	-	-	-	-	-	-	-	-	16112	2426.9	150.63
26-27	|	-	85012	-	-	-	-	-	-	-	-	-	-	85012	13183.8	155.08
27-28	|	-	389573	-	-	-	-	-	-	-	-	-	-	389573	67095.2	172.23
28-29	|	-	283993	11805	-	-	-	-	-	-	-	-	-	295798	55842.3	188.79
29-30	|	-	88577	-	-	-	-	-	-	-	-	-	-	88577	18314.9	206.77
30-31	|	-	3115	9435	-	-	-	-	-	-	-	-	-	12549	2909.8	231.87
31-32	|	-	7705	149	-	-	947	-	-	-	-	-	-	8801	2242.1	254.77
32-33	|	-	-	-	112	-	-	-	-	-	-	-	-	112	30.3	271.67
33-34	|	-	-	-	555	15120	-	-	-	-	-	-	-	15675	4797.5	306.05
34-35	|	-	-	-	947	-	3331	-	-	-	-	-	-	4277	1234.7	288.67
35-36	|	-	-	-	-	-	11185	112	3979	-	-	-	-	15276	5499.2	360.00
36-37	|	-	-	-	-	-	15988	37	-	-	-	-	-	16025	6187.8	386.14
37-38	|	-	-	-	-	-	-	-	238	-	-	15195	-	15433	6448.9	417.87
38-39	|	-	-	-	-	-	-	119	-	-	-	-	-	119	45.4	381.75
39-40	|	-	-	-	-	-	-	-	112	-	637	-	-	748	321.4	429.49
40-41	|	-	-	-	-	-	-	-	592	-	-	-	-	592	287.3	485.19
41-42	|	-	-	-	-	-	-	-	-	37	-	-	-	37	17.0	456.00
43-44	|	-	-	-	-	-	-	-	-	-	-	-	82	82	52.9	647.00
TSN(1000)	|	143738	874086	21388	1613	15120	31449	268	4921	37	637	15195	82	1108536	-	-
TSB(1000 kg)	|	14951.2	157321.4	4460.7	503.7	4625.1	11457.4	95.8	1774.0	17.0	273.9	6355.5	52.9	-	201888.6	-
Mean length (cm)	|	23.00	27.44	28.90	33.52	33.00	35.28	36.47	35.79	41.00	39.00	37.00	43.00	-	-	-
Mean weight (g)	|	104.02	179.98	208.56	312.23	305.88	364.31	357.71	360.49	456.00	430.16	418.27	647.00	-	-	182.12

Variable: Abundance

EstLayer: 1

Stratum: 99

SpecCat: MAKRELL

		age									
LenGrp		4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	|	-	-	-	71	-	-	-	71	30.0	424.20
36-37	|	-	71	141	141	71	-	-	424	192.3	453.47
37-38	|	71	-	283	141	-	-	-	495	229.3	463.51
38-39	|	-	-	141	71	141	71	-	424	221.2	521.70
39-40	|	-	-	141	71	71	353	-	636	362.7	570.26
40-41	|	-	-	71	283	-	71	71	495	291.4	589.06
41-42	|	-	-	-	-	-	71	-	71	46.6	659.00
43-44	|	-	-	-	71	-	-	-	71	56.1	794.50

TSN(1000)	71	71	777	848	283	565	71	2685	-	-
TSB(1000 kg)	33.9	32.6	388.8	468.8	138.1	323.9	43.4	-	1429.5	-
Mean length (cm)	37.00	36.00	37.64	38.42	37.75	39.25	40.00	-	-	-
Mean weight (g)	479.40	461.20	500.21	552.84	488.50	573.00	614.00	-	-	532.34

Variable: Abundance

EstLayer: 1

Stratum: 100

SpecCat: MAKRELL

	age											
LenGrp	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1430	-	-	-	-	-	-	-	-	1430	333.2	233.00
31-32	6788	649	-	-	-	-	-	-	-	7436	1901.9	255.76
32-33	9909	6982	3380	-	-	-	-	-	-	20272	6013.9	296.66
33-34	-	21345	20588	5762	19547	-	-	-	-	67243	22492.7	334.50
34-35	-	17662	70657	11950	30269	10318	-	-	-	140856	49233.9	349.53
35-36	-	5478	35014	92298	93158	16125	432	1025	432	243962	97448.6	399.44
36-37	-	3886	216	76223	76696	56511	11587	3915	-	229035	99152.9	432.92
37-38	-	-	3157	29422	85237	83400	7264	9527	2429	220435	104022.2	471.90
38-39	-	-	1929	11145	23370	48122	5760	999	499	91825	46946.4	511.26
39-40	-	-	-	-	19078	15998	6801	5781	4878	52536	28522.0	542.90
40-41	-	-	-	-	-	13176	15963	-	-	29139	17314.9	594.21
41-42	-	-	-	-	-	-	5337	1449	-	6786	4193.7	618.01
42-43	-	-	-	-	-	-	4722	-	-	4722	2834.4	600.20
TSN(1000)	18127	56002	134941	226801	347353	243650	57867	22697	8238	1115677	-	-
TSB(1000 kg)	4839.6	15909.7	51356.7	96555.9	150124.8	114657.9	31379.9	11286.0	4300.3	-	480410.8	-
Mean length (cm)	31.47	33.57	34.19	35.64	35.93	37.00	38.72	37.55	38.14	-	-	-
Mean weight (g)	266.98	284.09	380.59	425.73	432.20	470.58	542.28	497.24	521.99	-	-	430.60

Variable: Abundance

EstLayer: 1

Stratum: 103

SpecCat: MAKRELL

	age														
LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	Number	Biomass	Mean W

													(1E3)	(1E3kg)	(g)
28-29	|	1555	-	-	-	-	-	-	-	-	-	-	-	1555	295.5	190.00
29-30	|	3110	-	-	-	-	-	-	-	-	-	-	-	3110	697.2	224.15
30-31	|	-	3110	-	-	-	-	-	-	-	-	-	-	3110	699.5	224.90
31-32	|	-	6998	-	-	-	-	-	-	-	-	-	-	6998	1785.9	255.19
32-33	|	-	10130	-	-	-	-	-	-	-	-	-	-	10130	2666.2	263.20
33-34	|	-	-	13348	-	-	-	-	-	-	-	-	-	13348	4193.8	314.19
34-35	|	-	-	8833	-	9546	7776	-	-	-	-	-	-	26154	8855.3	338.58
35-36	|	-	4666	8897	10152	7458	65	22	-	-	-	-	-	31258	11548.3	369.45
36-37	|	-	22	8077	3118	10020	4902	3888	-	22	-	-	-	30048	11982.5	398.78
37-38	|	-	-	-	6616	3441	1022	3125	-	1555	-	-	-	15758	6843.6	434.28
38-39	|	-	-	-	64	2572	1620	4032	43	22	-	-	-	8353	3905.7	467.60
39-40	|	-	-	-	2354	1585	4146	79	-	22	23	-	22	8230	4163.0	505.83
40-41	|	-	-	-	-	21	880	73	-	30	22	8	22	1055	593.0	562.20
41-42	|	-	-	-	-	22	1577	22	115	43	-	-	-	1778	1076.7	605.48
42-43	|	-	-	-	8	-	15	-	8	23	44	-	-	98	59.0	604.25
43-44	|	-	-	-	-	-	15	-	15	-	-	-	-	29	19.0	650.95
44-45	|	-	-	-	-	-	-	8	-	-	-	-	-	8	6.5	808.50
TSN(1000)	|	4666	24926	39154	22313	34664	22015	11248	181	1715	88	8	43	161022	-	-
TSB(1000 kg)	|	992.7	6865.5	13808.1	9319.9	13095.7	9328.5	5034.5	101.5	765.7	49.0	4.8	24.7	-	59390.7	-
Mean length (cm)	|	28.67	32.03	34.30	36.17	35.62	36.58	37.06	40.49	37.24	40.74	40.00	39.50	-	-	-
Mean weight (g)	|	212.77	275.44	352.66	417.70	377.78	423.73	447.59	560.81	446.39	554.36	595.60	573.60	-	-	368.84

Variable: Abundance

EstLayer: 1

Stratum: 104

SpecCat: MAKRELL

	age													
LenGrp		2	3	4	5	6	7	8	9	10	13	14	Number	Biomass	Mean W
													(1E3)	(1E3kg)	(g)
26-27	|	467	-	-	-	-	-	-	-	-	-	-	467	77.0	165.00
27-28	|	467	-	-	-	-	-	-	-	-	-	-	467	80.7	173.00
28-29	|	1157	-	-	-	-	-	-	-	-	-	-	1157	223.9	193.56
29-30	|	1380	-	-	223	-	-	-	-	-	-	-	1604	331.5	206.71
30-31	|	3675	1434	-	-	-	-	-	-	-	-	-	5108	1196.7	234.27
31-32	|	3247	2290	257	-	-	-	-	-	-	-	-	5794	1475.1	254.58
32-33	|	-	3871	6003	308	-	33	-	-	-	-	-	10215	2913.5	285.23
33-34	|	33	6776	17521	1112	4575	97	-	-	-	-	-	30114	9860.6	327.44
34-35	|	4172	2689	8974	7751	5914	2425	-	-	-	-	-	31925	11221.0	351.48

35-36	-	911	15191	19125	7375	3012	4328	-	-	-	-	49941	19533.2	391.12
36-37	-	2775	7764	11911	20837	6489	672	440	-	-	-	50888	21413.6	420.80
37-38	-	-	1371	3001	8337	9619	12509	-	3357	-	-	38192	17460.9	457.18
38-39	-	-	380	239	5005	10292	4475	-	1875	-	-	22265	10665.6	479.02
39-40	-	-	912	-	191	583	1695	7741	-	-	-	11122	5880.2	528.68
40-41	-	33	-	-	64	-	3311	281	-	281	-	3970	2208.0	556.14
41-42	-	-	-	-	2804	591	-	-	-	-	559	3955	2285.8	578.01
42-43	-	-	-	-	-	-	223	1710	-	-	-	1933	1182.6	611.75
43-44	-	-	-	-	-	251	-	-	-	-	-	251	178.8	712.24
44-45	-	-	-	-	-	-	-	-	33	-	-	33	24.9	765.50
TSN(1000)	14598	20779	58373	43670	55101	33392	27212	10172	5264	281	559	269402	-	-
TSB(1000 kg)	3640.5	6696.6	21191.3	17153.1	23582.8	14915.8	12605.8	5553.1	2442.2	132.2	300.4	-	108213.8	-
Mean length (cm)	30.90	33.02	34.18	35.15	36.00	36.85	37.35	39.40	37.40	40.00	41.00	-	-	-
Mean weight (g)	249.39	322.28	363.03	392.79	427.99	446.68	463.24	545.94	463.94	470.49	537.18	-	-	401.68

Variable: Abundance

EstLayer: 1

Stratum: 105

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	16	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	123	-	-	-	-	-	-	-	-	-	-	-	123	28.1	228.71
29-30	1278	-	-	-	-	-	-	-	-	-	-	-	1278	314.5	246.00
30-31	-	6249	-	-	-	-	-	-	-	-	-	-	6249	1825.8	292.20
31-32	-	10609	-	-	-	-	-	-	-	-	-	-	10609	3305.5	311.57
32-33	253	507	9561	5673	1149	-	-	-	-	-	-	-	17143	5764.8	336.27
33-34	-	2085	15766	10569	-	-	-	-	-	-	-	-	28421	10272.6	361.45
34-35	-	2236	8618	20525	10535	9540	-	327	-	-	-	-	51781	19395.2	374.56
35-36	-	676	1304	8585	15883	10205	3100	176	-	-	-	-	39927	16049.4	401.96
36-37	-	209	487	6022	17569	17670	791	52	349	-	-	-	43150	18075.6	418.91
37-38	-	189	284	1607	10598	7223	812	51	603	-	-	-	21368	9638.2	451.06
38-39	-	-	-	839	114	69	2131	4247	-	-	-	-	7400	3617.0	488.77
39-40	-	-	-	-	-	-	1356	-	2210	1339	578	-	5483	2845.3	518.96
40-41	-	-	-	-	34	410	-	-	2913	105	-	-	3462	1929.3	557.24
41-42	-	-	-	-	-	-	18	776	-	1145	-	-	1939	1077.3	555.68
42-43	-	-	-	-	-	-	-	100	1179	-	28	-	1306	774.1	592.59
43-44	-	-	-	-	-	-	-	-	-	-	26	86	112	68.4	610.52
TSN(1000)	1655	22760	36020	53821	55883	45117	8207	5729	7254	2589	632	86	239752	-	-

TSB(1000 kg)	413.5	7215.8	13190.4	20483.4	23085.2	18471.5	3623.1	2878.7	3875.9	1379.7	311.1	52.6	-	94981.1	-
Mean length (cm)	29.38	31.44	33.12	34.13	35.45	35.55	36.75	38.13	39.58	39.92	39.30	43.00	-	-	-
Mean weight (g)	249.92	317.04	366.20	380.58	413.10	409.41	441.44	502.47	534.33	532.84	492.22	615.00	-	-	396.16

Variable: Abundance

EstLayer: 1

Stratum: 106

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	3761	-	-	-	-	-	-	-	-	-	-	3761	660.1	175.50
27-28	12048	-	-	-	-	-	-	-	-	-	-	12048	2374.7	197.10
28-29	30648	-	-	-	-	-	-	-	-	-	-	30648	6723.3	219.37
29-30	62561	7525	-	-	-	-	-	-	-	-	-	70086	16410.0	234.14
30-31	13392	16060	-	-	-	-	-	-	-	-	-	29452	7441.8	252.67
31-32	20053	14059	19469	-	-	-	-	-	-	-	-	53580	15198.8	283.66
32-33	-	51654	34835	6082	-	-	-	-	-	-	-	92571	28811.7	311.24
33-34	-	4922	19434	37279	14594	12025	-	-	-	-	-	88255	29568.9	335.04
34-35	-	-	3785	56568	7898	16957	9254	-	-	-	-	94462	34126.4	361.27
35-36	-	-	582	24843	34102	34717	23389	5120	-	-	-	122754	47115.0	383.82
36-37	-	-	36330	874	1457	11297	6947	5666	-	-	-	62573	24868.2	397.43
37-38	-	-	-	-	-	-	28282	-	-	-	-	28282	12818.9	453.26
38-39	-	-	-	-	5061	3773	3896	1886	-	-	-	14617	6725.9	460.14
39-40	-	-	-	-	-	-	-	-	-	5690	-	5690	2665.8	468.48
40-41	-	-	-	-	-	-	-	-	-	-	2732	2732	1419.5	519.52
43-44	-	-	-	-	-	4005	-	-	292	855	-	5151	3059.3	593.88
TSN(1000)	142463	94220	114435	125647	63113	82774	71769	12673	292	6546	2732	716664	-	-
TSB(1000 kg)	33441.9	27311.0	39287.0	44562.8	23494.7	31866.4	30248.2	4966.0	190.9	3199.5	1419.5	-	239988.1	-
Mean length (cm)	28.91	31.32	33.35	33.82	34.68	35.16	35.92	35.89	43.00	39.52	40.00	-	-	-
Mean weight (g)	234.74	289.86	343.31	354.67	372.26	384.98	421.47	391.87	655.00	488.80	519.52	-	-	334.87

Variable: Abundance

EstLayer: 1

Stratum: 107

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
24-25	-	208	-	-	-	-	-	-	-	-	208	25.7	124.00
26-27	162	1137	-	-	-	-	-	-	-	-	1299	227.5	175.14
27-28	-	44756	-	-	-	-	-	-	-	-	44756	8350.2	186.57
28-29	-	182442	-	-	-	-	-	-	-	-	182442	34959.9	191.62
29-30	-	173571	19555	-	-	-	-	-	-	-	193127	40374.4	209.06
30-31	-	78240	42416	-	-	-	-	-	-	-	120656	26879.8	222.78
31-32	-	7507	53293	9096	-	-	-	-	-	-	69896	17682.2	252.98
32-33	-	-	29158	17594	-	-	-	-	-	-	46751	13626.5	291.47
33-34	-	-	23970	3688	11117	-	-	-	-	-	38776	11735.4	302.65
34-35	-	-	7467	23904	6398	8474	-	-	-	-	46243	14990.7	324.17
35-36	-	-	-	23475	-	12511	8357	-	-	-	44342	15828.6	356.96
36-37	-	-	-	-	4636	3838	11261	-	-	-	19735	7805.7	395.53
37-38	-	-	-	-	-	8129	6669	-	-	-	14798	6045.2	408.51
38-39	-	-	-	-	27	-	2717	-	959	-	3703	1499.5	404.91
39-40	-	-	-	-	-	2717	2717	-	-	-	5434	2646.4	487.00
40-41	-	-	-	-	-	-	-	-	-	959	959	474.0	494.00
41-42	-	-	-	-	-	-	-	2717	-	-	2717	1369.4	504.00
TSN(1000)	162	487860	175860	77757	22178	35668	31722	2717	959	959	835843	-	-
TSB(1000 kg)	28.7	98671.3	45592.0	24556.7	7179.2	13662.0	12561.9	1369.4	426.0	474.0	-	204521.1	-
Mean length (cm)	26.00	28.62	31.10	33.45	33.92	35.63	36.38	41.00	38.00	40.00	-	-	-
Mean weight (g)	177.00	202.25	259.25	315.81	323.71	383.03	396.01	504.00	444.00	494.00	-	-	244.69

Variable: Abundance

EstLayer: 1

Stratum: 108

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	1864	-	-	-	-	-	-	-	1864	171.5	92.00
26-27	-	5592	-	-	-	-	-	-	5592	937.7	167.67
27-28	-	39336	-	-	-	-	-	-	39336	7029.9	178.71
28-29	-	72623	-	-	-	-	-	-	72623	13993.6	192.69
29-30	-	47494	-	-	-	-	-	-	47494	9964.9	209.82
30-31	-	5105	9603	-	-	-	-	-	14708	3528.1	239.88
31-32	-	-	17273	-	-	-	-	-	17273	4711.3	272.76

32-33	-	-	30003	-	-	-	-	-	30003	8862.6	295.39
33-34	-	-	4817	21615	-	11011	-	-	37443	12042.6	321.62
34-35	-	-	-	10855	10986	9441	-	7226	38508	13367.6	347.14
35-36	-	-	-	14515	19239	20526	8027	-	62307	23203.2	372.40
36-37	-	-	-	-	9410	7807	7965	-	25181	9954.4	395.31
37-38	-	-	-	-	-	3629	2602	-	6231	2610.7	418.97
38-39	-	-	-	-	-	1445	-	-	1445	711.1	492.00
39-40	-	-	-	-	-	-	2891	-	2891	1478.5	511.50
40-41	-	-	-	-	-	-	1864	-	1864	948.9	509.00
TSN(1000)	1864	170151	61696	46985	39634	53859	23348	7226	404764	-	-
TSB(1000 kg)	171.5	33157.7	17297.8	16329.6	14532.8	19795.1	9710.0	2522.0	-	113516.5	-
Mean length (cm)	23.00	28.04	31.49	33.85	34.96	34.78	36.46	34.00	-	-	-
Mean weight (g)	92.00	194.87	280.37	347.55	366.67	367.53	415.88	349.00	-	-	280.45

Variable: Abundance

EstLayer: 1

Stratum: 109

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	1687	-	-	-	-	-	-	-	-	-	1687	167.1	99.00
24-25	10629	-	-	-	-	-	-	-	-	-	10629	1245.1	117.14
25-26	-	3375	-	-	-	-	-	-	-	-	3375	469.1	139.00
26-27	-	17883	-	-	-	-	-	-	-	-	17883	2886.9	161.43
27-28	-	36444	-	-	-	-	-	-	-	-	36444	6401.4	175.65
28-29	-	55006	-	-	-	-	-	-	-	-	55006	10662.2	193.84
29-30	-	32565	-	-	-	-	-	-	-	-	32565	7202.5	221.17
30-31	-	8437	-	-	-	-	-	-	-	-	8437	2002.9	237.40
31-32	-	-	10629	-	-	-	-	-	-	-	10629	3092.8	290.99
32-33	-	-	-	31235	-	-	-	-	-	-	31235	9700.4	310.56
33-34	-	-	-	59399	-	-	-	-	-	-	59399	20197.8	340.03
34-35	-	-	-	15598	62069	3402	-	-	-	-	81069	29084.5	358.76
35-36	-	-	-	19424	65975	25207	7759	-	-	-	118364	45015.9	380.32
36-37	-	-	-	54	108	32803	19396	-	-	-	52362	21906.9	418.37
37-38	-	-	-	-	-	27	27	17313	-	-	17367	7500.5	431.88
38-39	-	-	-	-	-	-	7813	-	-	9446	17259	7768.7	450.13
39-40	-	-	-	-	-	-	-	-	-	3961	3961	1776.4	448.52
40-41	-	-	-	-	-	-	-	-	54	-	54	27.2	502.50
41-42	-	-	-	-	-	-	-	27	-	27	54	28.9	534.00

TSN(1000)	12316	153710	10629	125711	128152	61439	34995	17340	54	13434	557780	-	-
TSB(1000 kg)	1412.2	29625.1	3092.8	42713.8	47618.0	24539.8	14731.0	7492.6	27.2	5884.8	-	177137.3	-
Mean length (cm)	23.86	27.79	31.00	33.19	34.52	35.48	36.23	37.01	40.00	38.30	-	-	-
Mean weight (g)	114.66	192.73	290.99	339.78	371.57	399.42	420.95	432.10	502.50	438.06	-	-	317.58

Variable: Abundance

EstLayer: 1

Stratum: 119

SpecCat: MAKRELL

	age										
LenGrp	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	8177	8177	-	-	-	-	-	-	16353	4969.7	303.90
33-34	8177	24530	8177	-	-	-	-	-	40883	14701.4	359.60
34-35	8177	16353	40883	8177	-	-	-	-	73589	27182.9	369.39
35-36	8177	8177	16353	65412	24530	-	-	-	122648	48912.1	398.80
36-37	-	32706	32706	57236	16353	8177	8177	-	155354	67729.6	435.97
37-38	-	8177	16353	73589	73589	49059	-	-	220767	99992.7	452.93
38-39	-	-	-	24530	24530	24530	8177	8177	89942	45000.5	500.33
39-40	-	-	-	8177	24530	8177	8177	8177	57236	31383.2	548.31
40-41	-	-	-	-	-	-	8177	16353	24530	14109.5	575.20
41-42	-	-	-	-	-	-	-	8177	8177	5363.8	656.00
42-43	-	-	-	-	-	-	-	8177	8177	4967.3	607.50
TSN(1000)	32706	98119	114472	237120	163531	89942	32706	49059	817655	-	-
TSB(1000 kg)	11154.4	38688.2	46602.2	104630.4	76718.9	42384.0	15430.8	28703.8	-	364312.7	-
Mean length (cm)	33.50	34.58	35.07	36.28	37.05	37.36	38.25	40.00	-	-	-
Mean weight (g)	341.05	394.30	407.11	441.26	469.14	471.24	471.80	585.08	-	-	445.56

Variable: Abundance

EstLayer: 1

Stratum: 120

SpecCat: MAKRELL

	age														
LenGrp	3	4	5	6	7	8	9	10	11	12	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)

31-32	-	32	-	-	-	-	-	-	-	-	-	-	32	9.6	303.00
33-34	186	119	-	-	-	-	-	-	-	-	-	-	304	92.4	303.36
34-35	32	480	366	490	-	-	119	-	-	-	-	-	1487	530.9	357.06
35-36	321	616	2146	1540	356	32	150	-	-	-	-	-	5162	2086.5	404.23
36-37	-	-	8468	-	-	-	-	-	-	-	-	-	8468	3663.2	432.61
37-38	-	-	1609	3199	2659	1502	590	17	217	-	-	-	9793	4515.1	461.07
38-39	-	-	-	-	8643	-	-	-	-	-	-	-	8643	4463.3	516.40
39-40	-	-	-	4526	-	-	-	-	-	-	-	-	4526	2577.9	569.60
40-41	-	-	-	-	592	797	418	270	135	17	17	-	2247	1234.8	549.65
41-42	-	-	-	33	251	369	105	130	63	17	-	72	1041	622.7	598.29
42-43	-	-	32	-	186	-	186	89	89	17	-	-	597	390.4	653.95
43-44	-	-	-	-	72	-	33	48	-	32	48	-	234	159.5	682.67
TSN(1000)	538	1246	12621	9789	12759	2700	1602	554	505	82	65	72	42532	-	-
TSB(1000 kg)	190.5	464.4	5452.6	4872.5	6468.4	1393.8	790.0	318.3	265.8	50.3	41.4	38.5	-	20346.4	-
Mean length (cm)	34.25	34.32	35.91	37.47	37.95	38.41	38.34	40.73	39.18	41.77	42.23	41.00	-	-	-
Mean weight (g)	353.79	372.71	432.04	497.77	506.98	516.22	493.03	574.42	526.62	615.41	636.21	535.20	-	-	478.38

Variable: Abundance

EstLayer: 1

Stratum: 122

SpecCat: MAKRELL

	age												
LenGrp	2	3	4	5	6	7	8	9	10	11	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	641	-	-	641	-	-	-	-	-	-	1283	382.5	298.10
33-34	-	4524	-	5373	-	-	-	-	-	-	-	9897	3471.4	350.76
34-35	8339	392	2709	7244	67	-	-	4490	-	-	-	23242	8475.6	364.67
35-36	-	1079	13757	6558	5765	11788	-	-	-	-	-	38946	14607.0	375.06
36-37	-	1316	8339	10566	5745	5132	294	1316	-	-	-	32710	13311.7	406.96
37-38	-	1924	34	4798	6787	4930	361	67	-	-	-	18902	8615.8	455.82
38-39	-	1283	-	1809	4275	2941	2599	-	34	-	-	12941	6234.4	481.77
39-40	-	-	-	1924	98	2415	-	-	-	-	-	4437	2342.0	527.80
40-41	-	-	-	-	-	67	1924	1958	294	34	-	4277	2271.5	531.07
41-42	-	-	-	-	-	675	871	-	-	-	196	1742	1030.6	591.54
42-43	-	-	-	-	-	-	-	-	196	67	-	263	174.4	662.66
43-44	-	-	-	-	-	641	-	34	-	-	-	675	488.5	723.77
TSN(1000)	8339	11160	24839	38273	23379	28589	6050	7865	524	101	196	149315	-	-
TSB(1000 kg)	2993.8	4251.9	9631.5	15335.2	9859.2	12362.8	3124.8	3364.6	306.3	64.3	110.9	-	61405.2	-

Mean length (cm)	34.00	34.79	35.23	35.40	36.31	36.50	38.91	35.89	40.62	41.33	41.00	-	-	-
Mean weight (g)	359.00	380.99	387.76	400.68	421.71	432.44	516.46	427.77	584.76	639.53	565.60	-	-	411.25

Variable: Abundance

EstLayer: 1

Stratum: 123

SpecCat: MAKRELL

	age												
LenGrp	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	-	595	-	-	-	-	-	-	-	-	595	171.9	289.00
31-32	-	2379	-	-	-	-	-	-	-	-	2379	707.2	297.25
32-33	2974	2974	-	-	-	-	-	-	-	-	5948	1913.0	321.63
33-34	5786	-	10642	-	-	-	-	-	-	-	16427	5695.0	346.68
34-35	6971	9831	5114	629	-	-	-	-	-	-	22545	8119.7	360.15
35-36	4164	7242	8108	13498	8187	859	515	-	-	-	42571	16386.8	384.93
36-37	79	2536	937	12785	2321	9649	2204	3569	-	-	34079	14516.5	425.96
37-38	-	-	5124	7163	5126	4437	687	945	-	-	23481	10471.4	445.96
38-39	-	672	79	4486	1690	1574	-	687	-	-	9189	4379.7	476.64
39-40	-	1190	315	2708	6998	1971	-	-	343	-	13525	6925.9	512.07
40-41	-	984	-	669	1510	1921	630	1824	172	-	7709	4392.9	569.85
41-42	-	-	315	250	630	2134	329	315	595	-	4568	2621.9	574.02
42-43	-	-	-	315	973	-	-	-	-	-	1288	879.4	682.76
43-44	-	-	-	-	595	-	-	-	-	315	910	596.6	655.83
44-45	-	-	-	-	-	595	-	-	-	-	595	473.5	796.00
TSN(1000)	19973	28403	30632	42503	28029	23140	4365	7339	1110	315	185809	-	-
TSB(1000 kg)	6999.8	10694.9	11804.2	18660.7	12769.5	11136.7	1914.9	3447.4	619.6	203.7	-	78251.4	-
Mean length (cm)	33.63	34.40	34.61	36.36	37.45	37.55	36.99	37.52	40.23	43.00	-	-	-
Mean weight (g)	350.46	376.54	385.35	439.05	455.58	481.28	438.72	469.75	558.25	647.00	-	-	421.14

Variable: Abundance

EstLayer: 1

Stratum: 124

SpecCat: MAKRELL

	age									
LenGrp	2	3	4	5	6	7	8	9	Number	Biomass	Mean W

									(1E3)	(1E3kg)	(g)
27-28	187	-	-	-	-	-	-	-	187	28.2	151.00
29-30	863	-	-	-	-	-	-	-	863	190.7	221.00
30-31	1683	-	-	-	-	-	-	-	1683	374.4	222.50
31-32	-	5677	678	-	-	-	-	-	6355	1851.7	291.37
32-33	-	3611	9209	-	-	-	-	-	12820	4012.2	312.97
33-34	1442	10359	16661	1442	-	-	-	-	29904	10000.7	334.43
34-35	-	10407	20711	23721	9397	2830	-	-	67066	24209.7	360.99
35-36	-	1354	13173	34046	28502	-	-	-	77075	29679.7	385.07
36-37	-	550	6733	21696	18184	9369	8924	1903	67358	28071.8	416.75
37-38	-	-	3474	17057	11089	5343	-	-	36963	16653.6	450.55
38-39	-	-	3228	184	5099	6385	-	-	14896	7384.5	495.75
39-40	-	-	-	-	821	1008	821	-	2650	1308.9	494.00
40-41	-	-	-	-	811	-	-	1880	2692	1396.2	518.74
41-42	-	-	-	-	187	-	-	-	187	107.9	577.40
TSN(1000)	4174	31958	73867	98144	74090	24935	9745	3784	320697	-	-
TSB(1000 kg)	1065.6	10584.8	27285.8	39158.4	30534.7	10884.0	4028.7	1728.0	-	125270.1	-
Mean length (cm)	30.70	32.99	34.17	35.30	35.74	36.62	36.25	37.99	-	-	-
Mean weight (g)	255.29	331.21	369.39	398.99	412.13	436.50	413.41	456.70	-	-	390.62

Variable: Abundance

EstLayer: 1

Stratum: 125

SpecCat: MAKRELL

	age										
LenGrp	2	3	4	5	6	7	8	12	Number	Biomass	Mean W
									(1E3)	(1E3kg)	(g)
27-28	10982	-	-	-	-	-	-	-	10982	2239.1	203.90
28-29	35556	-	-	-	-	-	-	-	35556	7874.9	221.48
29-30	56577	-	-	-	-	-	-	-	56577	13659.1	241.42
30-31	21939	15026	19473	-	-	-	-	-	56439	14820.9	262.60
31-32	7171	32890	10388	-	-	-	-	-	50449	14846.1	294.28
32-33	7452	-	42336	-	-	-	-	-	49788	16324.3	327.88
33-34	1434	1656	40505	4140	8197	-	-	-	55932	19380.6	346.50
34-35	-	-	14096	25688	7369	-	-	-	47153	17911.2	379.85
35-36	-	-	1656	23589	2856	3312	4057	-	35470	14252.3	401.82
36-37	-	-	-	-	-	14389	-	-	14389	6122.5	425.49
37-38	-	-	-	-	6085	4524	-	-	10609	5016.4	472.82
38-39	-	-	-	828	-	-	828	-	1656	845.4	510.50

LenGrp	1	2	3	4	5	6	7	8	Number	Biomass	Mean W
40-41	-	-	-	-	-	2028	-	-	2028	1255.5	619.00
43-44	-	-	-	-	-	-	-	2028	2028	1332.6	657.00
TSN(1000)	141112	49573	128454	54245	24507	24254	4885	2028	429057	-	-
TSB(1000 kg)	34427.8	14071.6	42381.2	21076.1	9709.2	10778.8	2103.5	1332.6	-	135880.9	-
Mean length (cm)	29.05	30.76	32.19	34.42	34.53	36.38	35.51	43.00	-	-	-
Mean weight (g)	243.98	283.86	329.93	388.54	396.19	444.41	430.63	657.00	-	-	316.70

Variable: Abundance

EstLayer: 1

Stratum: 126

SpecCat: MAKRELL

	age													
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	894	-	-	-	-	-	-	-	-	-	-	-	894	101.0	113.00
26-27	-	10	-	-	-	-	-	-	-	-	-	-	10	1.6	162.00
27-28	-	1798	-	-	-	-	-	-	-	-	-	-	1798	369.9	205.79
28-29	-	9070	-	-	-	-	-	-	-	-	-	-	9070	1854.0	204.41
29-30	-	15663	-	-	-	-	-	-	-	-	-	-	15663	3448.5	220.17
30-31	-	3730	4456	904	-	-	-	-	-	-	-	-	9090	2302.3	253.29
31-32	-	-	20598	-	-	-	-	-	-	-	-	-	20598	5579.4	270.88
32-33	-	-	7389	5010	-	904	3382	-	-	-	-	-	16685	5131.3	307.54
33-34	-	-	-	34086	977	-	-	-	-	-	-	-	35062	11702.0	333.75
34-35	-	-	3576	24703	7917	8342	1673	483	-	-	-	-	46694	16911.6	362.18
35-36	-	-	-	894	16446	19204	3740	-	-	-	-	-	40284	15756.4	391.13
36-37	-	-	-	483	7611	9092	6621	3327	-	-	-	-	27135	11232.3	413.95
37-38	-	-	-	-	-	5433	10154	1449	-	-	-	-	17036	7600.6	446.15
38-39	-	-	-	-	-	251	-	832	1619	-	-	-	2703	1258.9	465.82
39-40	-	-	-	-	-	-	-	-	-	1691	-	-	1691	836.2	494.42
40-41	-	-	-	-	-	-	-	-	-	-	832	-	832	419.2	504.00
42-43	-	-	-	-	-	-	-	-	-	-	483	242	725	460.3	635.00
TSN(1000)	894	30270	36019	66079	32951	43225	25570	6092	1619	1691	1315	242	245968	-	-
TSB(1000 kg)	101.0	6675.8	10017.9	22784.1	12815.4	17330.9	10228.1	2522.4	774.1	836.2	723.6	155.9	-	84965.5	-
Mean length (cm)	23.00	28.70	31.38	33.31	34.93	35.22	35.59	36.35	38.00	39.00	40.73	42.00	-	-	-
Mean weight (g)	113.00	220.54	278.13	344.80	388.92	400.94	400.00	414.08	478.03	494.42	550.29	645.00	-	-	345.43

Variable: Abundance

EstLayer: 1

Stratum: 127

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	14575	-	-	-	-	-	-	-	-	-	14575	2809.9	192.80
28-29	48831	-	-	-	-	-	-	-	-	-	48831	10566.2	216.38
29-30	39363	-	-	-	-	-	-	-	-	-	39363	9179.4	233.20
30-31	39363	11809	-	-	-	-	-	-	-	-	51172	13084.2	255.69
31-32	-	45320	22447	-	-	-	-	-	-	-	67767	19242.2	283.95
32-33	-	37447	50851	-	-	-	-	-	-	-	88298	27848.5	315.39
33-34	-	-	86807	-	-	-	-	-	-	-	86807	29594.3	340.92
34-35	-	-	55958	24893	7873	13829	-	-	-	-	102553	37296.4	363.68
35-36	-	-	3936	7873	53297	11063	-	-	-	-	76169	29270.1	384.28
36-37	-	-	-	-	28404	22127	7873	-	-	-	58403	23984.3	410.67
37-38	-	-	-	-	13404	3936	-	-	-	-	17341	7643.8	440.80
38-39	-	-	-	-	-	2766	-	-	-	-	2766	1269.5	459.00
39-40	-	-	-	-	-	-	2766	2766	-	-	5532	2887.6	522.00
40-41	-	-	-	-	-	-	-	-	2766	-	2766	1501.9	543.00
41-42	-	-	-	-	-	3936	-	-	-	-	3936	2519.2	640.00
42-43	-	-	-	-	-	-	-	-	-	3936	3936	2405.1	611.00
TSN(1000)	142131	94575	220000	32765	102978	57658	10638	2766	2766	3936	670214	-	-
TSB(1000 kg)	32715.1	27929.0	73427.6	11749.6	40784.5	24529.7	4558.3	1501.9	1501.9	2405.1	-	221102.7	-
Mean length (cm)	28.73	31.27	32.85	34.24	35.46	35.83	36.78	39.00	40.00	42.00	-	-	-
Mean weight (g)	230.18	295.31	333.76	358.60	396.05	425.43	428.48	543.00	543.00	611.00	-	-	329.90

Variable: Abundance

EstLayer: 1

Stratum: 128

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22	277	-	-	-	-	-	-	-	-	-	-	-	-	277	21.6	78.00
22-23	596	-	-	-	-	-	-	-	-	-	-	-	-	596	54.8	91.89
26-27	-	650	-	-	-	-	-	-	-	-	-	-	-	650	124.2	191.00

27-28	-	650	-	-	-	-	-	-	-	-	-	-	-	650	165.9	255.00
28-29	-	3778	-	-	-	-	-	-	-	-	-	-	-	3778	814.2	215.51
29-30	-	2162	-	-	-	-	-	-	-	-	-	-	-	2162	505.3	233.74
30-31	-	736	4553	-	-	-	-	-	-	-	-	-	-	5289	1403.5	265.35
31-32	-	-	5529	-	-	-	-	-	-	-	-	-	-	5529	1585.8	286.83
32-33	-	-	14083	-	-	-	-	-	-	-	-	-	-	14083	4489.6	318.80
33-34	-	-	3252	15863	-	-	-	-	-	-	-	-	-	19115	6428.4	336.29
34-35	-	-	-	14105	9722	9490	-	-	-	-	-	-	-	33317	11993.6	359.98
35-36	-	-	-	526	16725	8717	11116	3729	-	-	-	-	-	40814	15536.6	380.67
36-37	-	-	-	3614	1739	19006	11599	3335	-	-	-	-	-	39293	15801.6	402.15
37-38	-	-	-	-	2736	6379	11496	4287	6230	1171	-	-	-	32300	13796.0	427.12
38-39	-	-	-	-	624	267	6171	4393	-	-	-	-	-	11455	5095.4	444.80
39-40	-	-	-	-	-	728	2820	4070	2526	-	89	-	319	10552	5169.5	489.89
40-41	-	-	-	-	-	-	267	-	2478	-	729	2446	-	5921	3099.5	523.50
41-42	-	-	-	-	-	-	357	544	597	1493	2907	-	-	5898	3289.1	557.69
42-43	-	-	-	-	-	319	-	-	178	-	-	-	-	498	290.2	583.30
43-44	-	-	-	-	-	-	-	775	-	-	-	-	-	775	502.8	648.37
44-45	-	-	-	-	-	-	-	-	-	89	319	-	-	408	289.6	709.10
TSN(1000)	872	7977	27417	34108	31546	44907	43827	21134	12009	2754	4045	2446	319	233360	-	-
TSB(1000 kg)	76.3	1794.2	8355.9	12061.4	11980.1	17660.3	18387.6	9476.8	5685.5	1379.2	2228.6	1241.0	130.3	-	90457.2	-
Mean length (cm)	21.68	28.21	31.58	33.76	34.98	35.63	36.55	37.41	38.31	39.40	41.01	40.00	39.00	-	-	-
Mean weight (g)	87.49	224.92	304.77	353.62	379.77	393.27	419.55	448.41	473.45	500.85	551.01	507.31	408.00	-	-	387.63

Variable: Abundance

EstLayer: 1

Stratum: 140

SpecCat: MAKRELL

	age			
LenGrp	5	Number	Biomass	Mean W
		(1E3)	(1E3kg)	(g)
35-36	93	93	34.3	370.00
TSN(1000)	93	93	-	-
TSB(1000 kg)	34.3	-	34.3	-
Mean length (cm)	35.00	-	-	-
Mean weight (g)	370.00	-	-	370.00

Variable: Abundance

EstLayer: 1

Stratum: 142

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	-	76	-	-	-	-	-	-	-	76	27.8	364.21
35-36	44	22	44	62	156	-	-	-	-	329	135.6	412.13
36-37	-	53	59	353	170	-	-	-	-	634	268.2	422.97
37-38	-	22	22	205	328	94	-	-	-	671	296.8	442.00
38-39	-	-	-	22	98	155	62	-	-	336	165.6	492.70
39-40	-	-	83	-	115	31	217	-	-	446	222.1	497.66
40-41	-	-	-	-	54	31	94	-	-	179	102.4	572.19
41-42	-	-	-	-	-	-	31	-	-	31	17.9	585.00
42-43	-	-	-	-	-	-	-	31	-	31	18.7	609.00
44-45	-	-	-	-	-	-	-	-	31	31	22.4	730.00
TSN(1000)	44	174	208	643	920	311	404	31	31	2764	-	-
TSB(1000 kg)	17.6	69.6	91.7	274.4	414.6	149.2	219.3	18.7	22.4	-	1277.5	-
Mean length (cm)	35.00	35.12	37.09	36.29	37.01	38.00	39.23	42.00	44.00	-	-	-
Mean weight (g)	396.60	400.65	440.92	426.96	450.85	480.23	542.96	609.00	730.00	-	-	462.14

Variable: Abundance

EstLayer: 1

Stratum: 143

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	2395	-	-	-	-	-	-	-	-	2395	739.0	308.52
33-34	-	249	-	-	-	-	-	-	-	249	80.1	321.44
34-35	-	3577	6253	-	-	-	-	-	-	9830	3451.9	351.15
35-36	-	1447	13189	8060	3359	-	-	-	-	26056	10004.6	383.97
36-37	-	5133	5739	12977	514	14556	-	-	-	38920	16159.4	415.20
37-38	-	-	3936	10064	16673	-	-	-	-	30673	13530.2	441.11
38-39	-	2239	-	4759	1278	327	-	-	-	8603	4064.0	472.37
39-40	-	-	-	-	1322	140	5133	-	-	6596	3267.8	495.45
40-41	-	-	-	-	-	-	-	1743	-	1743	923.6	529.94

41-42	|	-	-	-	-	2598	-	-	203	-	2800	1601.8	572.00
42-43	|	-	-	-	-	-	-	-	-	1229	1229	803.5	653.88
TSN(1000)	|	2395	12646	29117	35861	25744	15024	5133	1945	1229	129095	-	-
TSB(1000 kg)	|	739.0	5083.8	11287.4	15162.8	11659.7	6304.9	2545.4	1039.5	803.5	-	54625.9	-
Mean length (cm)	|	32.00	35.61	35.25	36.32	37.28	36.07	39.00	40.10	42.00	-	-	-
Mean weight (g)	|	308.52	402.00	387.66	422.82	452.91	419.66	495.87	534.35	653.88	-	-	423.15

Variable: Abundance

EstLayer: 1

Stratum: 144

SpecCat: MAKRELL

	age												
LenGrp		2	3	4	5	6	7	8	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	|	3293	-	-	-	-	-	-	-	-	3293	724.4	220.00
29-30	|	1532	-	-	-	-	-	-	-	-	1532	370.2	241.61
30-31	|	476	953	476	-	-	-	-	-	-	1905	532.5	279.50
31-32	|	5247	2216	-	-	4770	-	-	-	-	12233	3470.1	283.67
32-33	|	-	-	27723	-	-	-	-	-	-	27723	9222.2	332.65
33-34	|	-	31064	43953	26337	-	-	-	-	-	101354	35510.6	350.36
34-35	|	-	-	65684	28765	35476	28622	-	-	-	158547	60270.0	380.14
35-36	|	-	-	104047	58993	66306	19081	19081	-	-	267508	106622.5	398.58
36-37	|	-	-	4867	12198	130135	44526	14311	-	-	206036	89088.0	432.39
37-38	|	-	-	-	-	71932	2319	16692	-	-	90944	40584.1	446.25
38-39	|	-	-	-	-	11356	-	953	14649	-	26957	12957.2	480.66
39-40	|	-	-	-	-	-	-	4770	580	-	5350	2937.0	548.96
41-42	|	-	-	-	-	-	-	-	-	8063	8063	4617.4	572.66
42-43	|	-	-	-	-	-	-	-	476	-	476	277.2	582.00
TSN(1000)	|	10548	34233	246749	126293	319975	94548	55808	15705	8063	911921	-	-
TSB(1000 kg)	|	2593.5	11737.2	93215.1	48678.7	135812.7	38014.0	24973.1	7541.8	4617.4	-	367183.5	-
Mean length (cm)	|	29.73	32.79	34.05	34.45	35.79	35.22	36.25	38.16	41.00	-	-	-
Mean weight (g)	|	245.88	342.87	377.77	385.44	424.45	402.06	447.49	480.22	572.66	-	-	402.65

Variable: Abundance

EstLayer: 1

Stratum: 146

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	3161	-	-	-	-	-	-	-	-	-	3161	714.4	226.00
29-30	6322	-	-	-	-	-	-	-	-	-	6322	1545.8	244.50
30-31	11550	-	-	-	-	-	-	-	-	-	11550	3008.4	260.47
31-32	-	9484	-	-	-	-	-	-	-	-	9484	2620.6	276.33
32-33	-	13616	23100	-	-	-	-	-	-	-	36716	11822.5	322.00
33-34	-	-	79754	-	-	-	-	-	-	-	79754	27474.7	344.49
34-35	-	-	15806	64919	24795	-	-	-	-	-	105521	39980.9	378.89
35-36	-	-	38659	64796	15559	8265	-	-	-	-	127278	52040.7	408.87
36-37	-	-	-	25290	28327	22729	-	-	-	-	76346	32485.2	425.50
37-38	-	-	-	2066	22976	4133	4133	-	-	-	33307	15246.7	457.76
38-39	-	-	-	-	4133	6199	7294	-	-	-	17625	8787.4	498.57
39-40	-	-	-	-	-	-	-	10455	-	-	10455	5166.6	494.18
41-42	-	-	-	-	-	-	-	-	2066	3161	5227	3444.0	658.83
TSN(1000)	21033	23100	157318	157071	95790	41325	11426	10455	2066	3161	522746	-	-
TSB(1000 kg)	5268.7	6955.3	55697.8	62200.0	41195.1	18736.9	5673.5	5166.6	1458.8	1985.2	-	204338.0	-
Mean length (cm)	29.40	31.59	33.45	34.77	35.65	36.20	37.64	39.00	41.00	41.00	-	-	-
Mean weight (g)	250.49	301.10	354.05	396.00	430.06	453.40	496.53	494.18	706.00	628.00	-	-	390.89

Variable: Abundance

EstLayer: 1

Stratum: 148

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	5077	-	-	-	-	-	-	-	-	5077	1305.0	257.03
30-31	2280	-	-	-	-	-	-	-	-	2280	590.5	259.00
31-32	413	7875	-	-	-	-	-	-	-	8288	2355.3	284.18
32-33	-	8239	9675	-	-	-	-	-	-	17913	5727.8	319.75
33-34	-	-	34281	13680	9809	-	-	-	-	57770	19954.5	345.42
34-35	-	-	25292	13723	32972	11400	-	-	-	83387	30512.5	365.91
35-36	-	-	2280	30771	25742	24752	-	4560	-	88104	34909.2	396.23
36-37	-	-	449	35224	12595	30662	-	-	-	78930	33359.4	422.64
37-38	-	-	-	79	10621	15853	2533	9630	-	38716	17299.1	446.82

38-39	|	-	-	-	-	-	7657	-	9346	-	17003	8540.2	502.27
39-40	|	-	-	-	-	-	3671	79	-	-	3749	1958.8	522.42
40-41	|	-	-	-	-	-	844	79	4239	-	5162	2978.5	576.96
41-42	|	-	-	-	-	-	-	-	1442	413	1855	1164.0	627.57
43-44	|	-	-	-	-	-	-	-	1399	-	1399	896.6	641.00
TSN(1000)	|	7771	16113	71977	93476	91739	94839	2691	30615	413	409634	-	-
TSB(1000 kg)	|	2005.0	4920.7	25295.0	36478.4	35779.2	40555.7	1307.6	14921.2	288.8	-	161551.5	-
Mean length (cm)	|	29.40	31.51	33.30	34.94	34.80	35.98	37.15	37.89	41.00	-	-	-
Mean weight (g)	|	258.03	305.38	351.43	390.24	390.01	427.63	485.90	487.38	699.00	-	-	394.38

Variable: Abundance

EstLayer: 1

Stratum: 162

SpecCat: MAKRELL

LenGrp	age	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	|	494	-	-	-	-	-	-	-	-	-	494	157.5	319.00
33-34	|	-	3197	-	-	-	-	-	-	-	-	3197	1085.3	339.45
34-35	|	-	-	-	9108	-	-	-	-	-	-	9108	3418.3	375.32
35-36	|	-	3197	18319	20451	5466	-	-	-	-	-	47434	18397.3	387.85
36-37	|	-	2469	11536	41783	11891	8233	-	-	-	-	75911	31757.9	418.36
37-38	|	-	-	3866	38498	25035	6313	-	-	-	-	73712	32589.3	442.12
38-39	|	-	-	-	6604	21828	4977	12297	-	-	-	45706	21785.9	476.66
39-40	|	-	-	-	-	2469	3874	11648	-	-	1546	19537	10126.2	518.31
40-41	|	-	-	-	-	-	4889	-	-	6074	-	10963	5916.8	539.73
41-42	|	-	-	-	-	-	1975	-	357	4296	-	6628	3907.6	589.59
42-43	|	-	-	-	-	-	-	-	3567	-	-	3567	2247.2	629.92
43-44	|	-	-	-	-	-	-	-	773	-	-	773	486.4	629.00
44-45	|	-	-	-	-	-	-	-	-	1222	-	1222	908.1	743.00
TSN(1000)	|	494	8863	33721	116444	66689	30260	23945	4698	11592	1546	298252	-	-
TSB(1000 kg)	|	157.5	3223.3	13761.8	48814.8	30034.4	14458.2	11787.5	2926.6	6761.2	858.3	-	132783.7	-
Mean length (cm)	|	32.00	34.56	35.57	36.11	37.06	37.89	38.49	42.09	40.79	39.00	-	-	-
Mean weight (g)	|	319.00	363.68	408.11	419.21	450.36	477.81	492.28	623.01	583.26	555.00	-	-	445.21

Variable: Abundance

EstLayer: 1

Stratum: 164

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	1680	-	-	-	-	-	-	-	-	-	1680	394.7	235.00
32-33	-	-	-	-	345	-	-	-	-	-	345	106.0	307.00
33-34	-	2025	3705	5039	691	345	-	-	-	-	11806	4127.4	349.61
34-35	-	-	3705	10078	6075	1680	-	-	-	-	21538	7758.0	360.19
35-36	-	5039	11115	7457	14474	-	-	1036	-	-	39121	14850.0	379.59
36-37	-	-	-	40314	6766	5181	-	2418	-	-	54679	22488.5	411.28
37-38	-	-	-	6719	3359	6719	4490	2763	2763	-	26815	12012.2	447.97
38-39	-	-	-	-	6719	-	8399	5432	1036	-	21586	10448.1	484.02
39-40	-	-	-	-	-	5039	-	1727	-	-	6766	3328.2	491.87
40-41	-	-	-	-	-	-	-	-	2716	-	2716	1473.5	542.52
41-42	-	-	-	-	-	-	1680	-	1680	-	3359	2015.7	600.00
42-43	-	-	-	-	-	-	1680	-	-	345	2025	1193.6	589.38
44-45	-	-	-	-	-	-	-	-	1680	-	1680	1106.9	659.00
TSN(1000)	1680	7064	18524	69607	38431	18965	16249	13377	9875	345	194117	-	-
TSB(1000 kg)	394.7	2650.2	6863.3	27765.9	15870.7	8327.5	7800.0	6132.5	5315.6	182.4	-	81302.8	-
Mean length (cm)	29.00	34.43	34.40	35.48	35.65	36.92	38.45	37.33	39.80	42.00	-	-	-
Mean weight (g)	235.00	375.15	370.50	398.89	412.97	439.11	480.04	458.45	538.28	528.00	-	-	418.83

Variable: Abundance

EstLayer: 1

Stratum: 165

SpecCat: MAKRELL

LenGrp	age 2	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	3758	-	-	-	-	-	-	-	3758	1161.2	309.00
33-34	-	-	41896	-	-	-	-	-	41896	14333.7	342.13
34-35	-	836	37581	41339	-	-	-	-	79755	28743.4	360.40
35-36	-	-	1671	1950	101468	-	-	-	105089	41712.8	396.93
36-37	-	-	836	100080	1114	-	-	-	102030	43066.0	422.09
37-38	-	-	1671	5014	1671	33823	-	-	42180	19152.8	454.08
38-39	-	-	279	3343	-	-	11274	-	14896	7323.5	491.66

LenGrp									Number	Biomass	Mean W
39-40	-	-	4315	557	4037	-	557	279	9745	5171.3	530.68
40-41	-	-	-	-	3758	-	-	-	3758	2153.4	573.00
41-42	-	-	-	-	279	-	-	-	279	131.8	473.00
42-43	-	-	-	279	-	-	-	-	279	164.9	592.00
TSN(1000)	3758	836	88249	152562	112327	33823	11831	279	403663	-	-
TSB(1000 kg)	1161.2	313.7	32188.7	61908.3	45957.4	15475.7	5967.7	142.1	-	163114.8	-
Mean length (cm)	31.00	34.00	33.88	35.54	35.37	37.00	38.05	39.00	-	-	-
Mean weight (g)	309.00	375.33	364.75	405.79	409.14	457.56	504.40	510.00	-	-	404.09

Variable: Abundance

EstLayer: 1

Stratum: 166

SpecCat: MAKRELL

	age											
LenGrp	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	9776	-	-	-	-	-	-	-	-	9776	3155.9	322.83
33-34	6297	34905	736	-	-	-	-	-	-	-	41938	14189.7	338.35
34-35	-	27486	-	59021	21815	-	-	-	-	-	108322	39367.6	363.43
35-36	16193	21651	25849	58654	56720	-	-	-	-	-	179067	70215.1	392.12
36-37	-	18592	24760	49596	27704	30542	-	-	-	-	151192	64275.3	425.12
37-38	-	-	3680	42820	15225	26179	-	-	-	-	87904	39571.8	450.17
38-39	-	-	-	3149	7987	10660	-	-	-	-	21796	10718.1	491.74
39-40	-	-	-	-	736	-	5835	-	-	-	6571	3462.0	526.85
40-41	-	-	-	-	2208	-	-	-	-	-	2208	1260.8	571.00
41-42	-	-	-	-	-	-	1050	1050	-	-	2099	1342.4	639.50
42-43	-	-	-	-	-	-	1050	-	736	-	1786	1248.9	699.43
43-44	-	-	-	-	-	-	-	-	-	1472	1472	1037.1	704.50
44-45	-	-	-	-	-	-	-	-	-	736	736	502.0	682.00
TSN(1000)	22490	112408	55024	213239	132396	67381	7934	1050	736	2208	614867	-	-
TSB(1000 kg)	8167.5	41241.8	21995.7	86063.6	54908.9	30759.4	4448.9	684.3	537.3	1539.0	-	250346.5	-
Mean length (cm)	34.44	34.04	35.56	35.40	35.56	36.70	39.66	41.00	42.00	43.33	-	-	-
Mean weight (g)	363.16	366.89	399.74	403.60	414.73	456.50	560.73	652.00	730.00	697.00	-	-	407.16

Variable: Abundance

EstLayer: 1

Stratum: 167

SpecCat: MAKRELL

LenGrp		3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
	age													
33-34	|	971	-	1145	-	-	-	-	-	-	-	2117	764.1	360.95
34-35	|	-	736	2559	145	-	190	-	-	-	-	3631	1351.9	372.35
35-36	|	-	-	3151	4634	1695	1302	233	-	-	-	11015	4540.9	412.23
36-37	|	-	-	397	4041	3444	5258	95	-	-	-	13235	5939.1	448.75
37-38	|	-	-	29	1836	1753	4143	3705	-	-	-	11467	5403.5	471.24
38-39	|	-	-	-	58	87	831	686	1943	571	-	4177	2027.2	485.36
39-40	|	-	-	-	-	-	-	-	1170	-	381	1551	796.7	513.82
40-41	|	-	-	-	-	29	678	-	-	-	-	707	429.9	607.99
41-42	|	-	-	-	-	-	124	-	161	-	-	286	174.9	612.55
42-43	|	-	-	-	-	-	-	-	-	95	-	95	71.0	746.00
TSN(1000)	|	971	736	7281	10715	7009	12527	4719	3274	666	381	48280	-	-
TSB(1000 kg)	|	351.6	278.2	2797.5	4626.1	3087.2	5877.0	2290.4	1618.9	359.7	212.6	-	21499.2	-
Mean length (cm)	|	33.00	34.00	34.40	35.72	36.05	36.60	37.03	38.51	38.57	39.00	-	-	-
Mean weight (g)	|	361.97	377.93	384.19	431.73	440.49	469.14	485.34	494.43	540.14	558.75	-	-	445.30

Variable: Abundance

EstLayer: 1

Stratum: 183

SpecCat: MAKRELL

LenGrp		5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
	age										
34-35	|	1974	-	-	-	-	-	-	1974	711.5	360.50
35-36	|	-	8034	7895	-	-	-	-	15929	6385.0	400.85
36-37	|	279	10855	9868	-	-	-	-	21002	8893.9	423.48
37-38	|	70	70	21002	11048	-	-	-	32189	14594.9	453.41
38-39	|	-	-	70	13885	-	-	-	13955	6964.5	499.07
39-40	|	-	70	2043	3169	5991	139	-	11412	6044.0	529.61
40-41	|	-	-	-	-	139	3030	-	3169	1813.5	572.20
41-42	|	-	-	-	-	123	1180	70	1372	907.9	661.49
42-43	|	-	-	-	-	-	193	-	193	129.1	669.56
TSN(1000)	|	2322	19028	40878	28103	6253	4542	70	101195	-	-

TSB(1000 kg)	856.1	7832.9	18289.8	13368.9	3322.4	2731.0	43.3	-	46444.4	-
Mean length (cm)	34.33	35.59	36.47	37.72	39.06	40.31	41.00	-	-	-
Mean weight (g)	368.70	411.64	447.42	475.72	531.33	601.30	622.00	-	-	458.96

Variable: Abundance

EstLayer: 1

Stratum: 185

SpecCat: MAKRELL

LenGrp	age 3	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	1404	-	-	-	-	-	-	-	-	1404	453.6	323.00
34-35	-	9185	-	-	-	-	-	-	-	9185	3355.6	365.32
35-36	-	1710	32033	-	-	-	-	-	-	33743	13257.0	392.88
36-37	-	13588	23343	15562	-	-	-	-	-	52494	22213.1	423.16
37-38	-	-	9830	17578	-	-	-	2808	-	30216	13323.9	440.96
38-39	-	-	-	760	11994	950	-	-	-	13704	6756.8	493.06
39-40	-	-	-	-	2354	1404	4213	-	-	7971	4260.5	534.49
40-41	-	-	-	-	3568	-	-	-	-	3568	2054.1	575.65
41-42	-	-	-	-	-	-	3568	-	-	3568	2168.1	607.59
42-43	-	-	-	-	-	380	-	190	2808	3378	2117.5	626.77
43-44	-	-	-	-	190	-	-	-	-	190	134.5	708.00
TSN(1000)	1404	24483	65206	33900	18106	2734	7781	2998	2808	159422	-	-
TSB(1000 kg)	453.6	9752.4	26693.6	14794.0	9322.6	1436.8	4509.0	1404.1	1728.6	-	70094.7	-
Mean length (cm)	33.00	35.18	35.66	36.56	38.58	39.07	39.92	37.32	42.00	-	-	-
Mean weight (g)	323.00	398.33	409.37	436.40	514.88	525.50	579.48	468.27	615.50	-	-	439.68

IESSNS 2013. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 12

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Number	Biomass	Mean W

LenGrp	1	2	3	4	5	6	7	8	Number	Biomass	Mean W
									(1E3)	(1E3kg)	(g)
25-26	9033	-	-	-	-	-	-	-	9033	1153.2	127.67
26-27	27259	-	-	-	-	-	-	-	27259	3839.0	140.83
27-28	64190	-	-	-	-	-	-	-	64190	10297.4	160.42
28-29	90410	6022	-	-	-	-	-	-	96431	16828.7	174.51
29-30	36211	21158	-	-	-	-	-	-	57369	10973.5	191.28
30-31	-	30110	-	-	-	-	-	-	30110	6612.1	219.60
31-32	-	6182	-	-	-	-	-	-	6182	1461.3	236.38
32-33	-	9421	167	84	-	-	-	-	9673	2401.5	248.27
33-34	-	-	400	-	-	80	-	-	480	135.2	281.83
34-35	-	-	-	400	-	-	-	-	400	117.9	294.80
35-36	-	-	80	-	400	-	-	80	560	181.9	324.86
36-37	-	-	-	-	3091	-	-	-	3091	1118.0	361.70
37-38	-	-	-	-	80	160	80	-	320	113.9	356.00
TSN(1000)	227102	72893	647	484	3571	240	80	80	305097	-	-
TSB(1000 kg)	37858.7	15639.6	185.8	140.4	1272.9	78.9	29.6	27.5	-	55233.4	-
Mean length (cm)	27.52	29.89	32.99	33.65	35.91	35.67	37.00	35.00	-	-	-
Mean weight (g)	166.70	214.56	287.09	290.33	356.48	329.00	370.00	344.00	-	-	181.04

Variable: Abundance

EstLayer: 1

Stratum: 31

SpecCat: MAKRELL

	age												
LenGrp	1	2	3	4	5	6	7	8	9	10	12	Number	Biomass	Mean W
												(1E3)	(1E3kg)	(g)
23-24	4864	-	-	-	-	-	-	-	-	-	-	4864	464.5	95.50
24-25	-	15006	-	-	-	-	-	-	-	-	-	15006	1660.6	110.67
25-26	-	20656	-	-	-	-	-	-	-	-	-	20656	2575.4	124.68
26-27	-	38081	-	-	-	-	-	-	-	-	-	38081	5390.9	141.57
27-28	-	98408	17015	-	-	-	-	-	-	-	-	115423	18473.3	160.05
28-29	-	58404	12381	-	-	-	-	-	-	-	-	70785	12347.1	174.43
29-30	-	8332	34819	-	-	-	-	-	-	-	-	43152	8928.9	206.92
30-31	-	-	20919	-	-	-	-	-	-	-	-	20919	4618.0	220.75
31-32	-	116	17625	-	-	-	-	-	-	-	-	17740	4350.6	245.24
32-33	-	-	10029	4237	-	-	-	-	-	-	-	14267	3631.9	254.57
33-34	-	-	3806	809	-	3929	-	-	-	-	-	8543	2489.9	291.45
34-35	-	-	-	5007	462	347	-	-	-	-	-	5816	1761.7	302.89
35-36	-	-	-	-	8101	-	7289	-	-	-	-	15390	5420.5	352.22

36-37	|	-	-	-	-	-	7751	-	7435	5204	-	-	20391	7625.0	373.94
37-38	|	-	-	-	-	-	-	3586	2548	-	-	-	6134	2320.1	378.22
38-39	|	-	-	-	-	-	-	-	-	11225	-	-	11225	4835.3	430.78
39-40	|	-	-	-	-	-	-	-	-	-	4283	-	4283	2008.1	468.83
40-41	|	-	-	-	-	-	-	1735	116	-	-	-	1851	957.6	517.31
42-43	|	-	-	-	-	-	-	-	-	-	-	116	116	70.0	605.00
TSN(1000)	|	4864	239002	116594	10054	8563	12026	12610	10099	16429	4283	116	434641	-	-
TSB(1000 kg)	|	464.5	37092.2	24851.9	2898.8	3040.6	4113.8	4788.9	3791.2	6809.5	2008.1	70.0	-	89929.5	-
Mean length (cm)	|	23.00	26.80	29.47	33.08	34.95	34.96	36.26	36.30	37.37	39.00	42.00	-	-	-
Mean weight (g)	|	95.50	155.20	213.15	288.33	355.08	342.07	379.76	375.41	414.48	468.83	605.00	-	-	206.91

Variable: Abundance

EstLayer: 1

Stratum: 32

SpecCat: MAKRELL

		age										
LenGrp		1	2	3	4	5	6	7	8	Unknown	Number	Biomass	Mean W
											(1E3)	(1E3kg)	(g)
20-21	|	1078	-	-	-	-	-	-	-	-	1078	71.7	66.50
21-22	|	329	-	-	-	-	-	-	-	-	329	22.7	69.00
22-23	|	-	-	-	-	-	-	-	-	329	329	28.6	87.00
23-24	|	5032	-	-	-	-	-	-	-	-	5032	474.5	94.29
24-25	|	544	3871	-	-	-	-	-	-	-	4415	513.6	116.32
25-26	|	-	12328	6121	-	-	-	-	-	-	18449	2350.5	127.40
26-27	|	-	50621	5614	-	-	-	-	-	-	56235	7798.0	138.67
27-28	|	-	74881	3951	-	-	-	-	-	-	78832	12245.5	155.34
28-29	|	-	35794	3465	-	-	-	-	-	-	39260	6518.0	166.02
29-30	|	-	3106	12179	-	-	-	-	-	-	15285	2938.7	192.26
30-31	|	-	329	1689	-	-	-	-	-	-	2017	430.1	213.20
32-33	|	-	-	821	493	-	-	-	-	-	1314	350.8	266.88
33-34	|	-	-	-	1807	493	-	-	-	-	2300	642.4	279.29
34-35	|	-	-	-	-	-	986	329	-	-	1314	427.8	325.50
35-36	|	-	-	-	493	-	493	493	-	-	1479	488.0	330.00
37-38	|	-	-	-	-	-	2424	-	-	-	2424	917.6	378.47
38-39	|	-	-	-	-	-	-	-	493	-	493	241.0	489.00
TSN(1000)	|	6983	180931	33840	2793	493	3903	821	493	329	230586	-	-
TSB(1000 kg)	|	632.0	27209.5	5737.0	808.1	133.6	1425.3	244.5	241.0	28.6	-	36459.5	-
Mean length (cm)	|	22.52	26.76	27.57	33.18	33.00	35.99	34.60	38.00	22.00	-	-	-
Mean weight (g)	|	90.51	150.39	169.53	289.29	271.00	365.16	297.60	489.00	87.00	-	-	158.12

Variable: Abundance

EstLayer: 1

Stratum: 47

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	8	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
18-19	-	-	-	-	-	-	-	861	861	42.6	49.50
19-20	7317	-	-	-	-	-	-	-	7317	439.4	60.06
20-21	7594	-	-	-	-	-	-	-	7594	499.4	65.76
21-22	5165	-	-	-	-	-	-	-	5165	391.2	75.75
22-23	-	-	-	-	-	-	-	1291	1291	127.0	98.33
23-24	3443	1722	-	-	-	-	-	-	5165	557.8	108.00
24-25	1231	5719	-	-	-	-	-	-	6950	861.0	123.88
25-26	-	16516	-	-	-	-	-	-	16516	2354.0	142.53
26-27	-	24913	-	-	-	-	-	-	24913	3875.3	155.55
27-28	-	26051	-	-	-	-	-	-	26051	4524.1	173.66
28-29	-	39707	-	-	-	-	-	-	39707	7667.6	193.10
29-30	-	18085	-	-	-	-	-	-	18085	3942.3	217.99
30-31	-	-	6121	-	-	-	-	-	6121	1485.4	242.69
31-32	-	-	-	1568	-	-	-	-	1568	395.5	252.16
32-33	-	-	-	2152	-	-	-	-	2152	640.9	297.80
33-34	-	-	-	-	2429	-	-	-	2429	788.2	324.48
34-35	-	-	-	-	-	-	1568	-	1568	540.9	344.88
35-36	-	-	-	-	-	-	861	-	861	334.8	389.00
36-37	-	-	-	-	-	430	-	-	430	176.9	411.00
TSN(1000)	24749	132713	6121	3720	2429	430	2429	2152	174744	-	-
TSB(1000 kg)	1839.5	23272.7	1485.4	1036.4	788.2	176.9	875.8	169.6	-	29644.5	-
Mean length (cm)	20.53	26.95	30.00	31.58	33.00	36.00	34.35	20.40	-	-	-
Mean weight (g)	74.33	175.36	242.69	278.56	324.48	411.00	360.51	78.80	-	-	169.65

Variable: Abundance

EstLayer: 1

Stratum: 50

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	11	12	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	-	-	-	-	-	-	-	-	-	-	-	3509	3509	266.7	76.00
23-24	533	-	-	-	-	-	-	-	-	-	-	-	533	60.2	113.00
24-25	4394	-	-	-	-	-	-	-	-	-	-	-	4394	516.7	117.59
25-26	31823	-	-	-	-	-	-	-	-	-	-	-	31823	3960.9	124.47
26-27	90283	-	-	-	-	-	-	-	-	-	-	-	90283	12836.0	142.18
27-28	97929	16473	-	-	-	-	-	-	-	-	-	-	114402	17724.4	154.93
28-29	111909	50851	-	-	-	-	-	-	-	-	-	-	162760	27479.6	168.84
29-30	29314	93894	-	-	-	-	-	-	-	-	-	-	123208	24184.8	196.29
30-31	4303	43307	15420	-	-	-	-	-	-	-	-	-	63030	13482.0	213.90
31-32	-	10444	6704	-	-	-	-	-	-	-	-	-	17147	4001.4	233.35
32-33	-	272	2797	3999	-	1592	-	-	-	-	-	-	8660	2428.1	280.37
33-34	-	-	-	-	5932	-	-	-	-	-	-	-	5932	1756.4	296.11
34-35	-	855	510	5985	3054	763	763	1181	-	-	-	-	13111	4276.3	326.17
35-36	-	-	-	2389	12691	6858	-	-	-	-	-	-	21939	7530.9	343.27
36-37	-	-	-	1181	4232	7408	3388	-	-	-	-	-	16209	5968.9	368.25
37-38	-	-	-	-	1766	10295	9271	1766	1603	-	-	-	24700	9535.0	386.02
38-39	-	-	-	-	-	3340	5322	2357	1015	761	-	-	12796	5386.6	420.97
39-40	-	-	-	-	-	619	2138	1936	2867	1936	3039	-	12536	5720.6	456.34
40-41	-	-	-	-	-	-	-	1179	1524	2377	-	-	5080	2424.7	477.29
41-42	-	-	-	-	-	-	-	-	591	1780	763	-	3134	1702.3	543.18
42-43	-	-	-	-	-	-	-	-	-	-	619	-	619	331.8	536.00
TSN(1000)	370488	216094	25431	13554	27674	30876	20883	8419	7600	6855	4421	3509	735804	-	-
TSB(1000 kg)	58049.2	41807.0	5657.3	4341.7	9292.0	11456.9	8372.2	3472.0	3404.3	3339.0	2115.8	266.7	-	151574.2	-
Mean length (cm)	27.04	28.93	30.56	33.76	34.74	36.13	37.19	37.74	38.80	39.76	39.77	22.00	-	-	-
Mean weight (g)	156.68	193.47	222.46	320.32	335.76	371.06	400.91	412.40	447.96	487.11	478.61	76.00	-	-	206.00

Variable: Abundance

EstLayer: 1

Stratum: 61

SpecCat: MAKRELL

LenGrp (age)	3	4	5	6	7	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	2253	-	-	-	-	2253	471.3	209.14
30-31	6636	-	-	-	-	6636	1605.1	241.88
31-32	7111	-	-	-	-	7111	1783.5	250.80

32-33	|	6695	3282	-	-	-	9977	2728.1	273.45
33-34	|	-	1166	7789	65	-	9020	2893.0	320.74
34-35	|	2800	2872	5601	65	-	11338	3868.5	341.19
35-36	|	-	16476	65	65	196	16802	6384.9	380.01
36-37	|	-	130	1224	5191	4376	10922	4512.9	413.21
37-38	|	-	-	4507	-	1159	5666	2530.4	446.61
38-39	|	-	-	-	-	3894	3894	1763.2	452.77
39-40	|	-	-	-	-	547	547	275.6	503.80
TSN(1000)	|	25495	23926	19185	5386	10172	84165	-	-
TSB(1000 kg)	|	6663.5	8557.3	6970.0	2194.0	4431.6	-	28816.4	-
Mean length (cm)	|	31.16	34.38	34.43	35.93	37.02	-	-	-
Mean weight (g)	|	261.36	357.66	363.30	407.33	435.65	-	-	342.38

Variable: Abundance

EstLayer: 1

Stratum: 65

SpecCat: MAKRELL

	age															
LenGrp		2	3	4	5	6	7	8	9	10	11	12	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
24-25	|	300	-	-	-	-	-	-	-	-	-	-	-	-	300	39.6	132.00
25-26	|	1199	-	-	-	-	-	-	-	-	-	-	-	-	1199	177.2	147.75
26-27	|	6132	-	-	-	-	-	-	-	-	-	-	-	-	6132	987.9	161.11
27-28	|	14095	-	-	-	-	-	-	-	-	-	-	-	-	14095	2467.1	175.03
28-29	|	6804	-	-	-	-	-	-	-	-	-	-	-	-	6804	1293.8	190.14
29-30	|	2223	2823	-	-	-	-	-	-	-	-	-	-	-	5046	1085.2	215.08
30-31	|	1799	5046	-	-	-	-	-	-	-	-	-	-	-	6844	1655.8	241.92
31-32	|	-	1861	-	-	-	-	-	-	-	-	-	-	-	1861	494.5	265.73
32-33	|	-	-	1923	-	-	-	-	-	-	-	-	-	-	1923	612.7	318.58
33-34	|	-	-	2585	-	1261	-	-	-	-	-	-	-	-	3846	1255.4	326.38
34-35	|	-	-	1086	600	-	-	-	-	-	-	-	-	-	1686	592.7	351.61
35-36	|	-	-	-	600	1199	2172	-	-	-	-	-	-	-	3971	1479.3	372.56
36-37	|	-	-	-	1748	-	2709	-	-	-	-	-	-	-	4457	1780.7	399.53
37-38	|	-	-	-	-	4757	-	-	-	-	-	-	-	-	4757	2143.9	450.71
38-39	|	-	-	-	-	-	3071	1686	-	-	-	-	-	-	4757	2326.8	489.15
39-40	|	-	-	-	-	-	-	724	1086	899	-	-	-	-	2709	1379.1	509.02
40-41	|	-	-	-	-	-	-	-	-	-	1024	-	-	-	1024	553.1	540.26
41-42	|	-	-	-	362	362	-	300	-	362	724	362	362	-	2834	1604.4	566.20
42-43	|	-	-	-	-	300	-	362	-	-	362	-	-	300	1324	872.8	659.42

TSN(1000)	32552	9729	5594	3309	7879	7952	3071	1086	1261	2110	362	362	300	75568	-	-
TSB(1000 kg)	5874.5	2326.6	1843.3	1362.3	3401.3	3364.5	1621.9	566.1	652.2	1182.2	213.2	203.1	190.7	-	22801.9	-
Mean length (cm)	27.22	29.90	32.85	36.00	36.43	36.50	39.00	39.00	39.57	40.69	41.00	41.00	42.00	-	-	-
Mean weight (g)	180.47	239.13	329.50	411.71	431.68	423.08	528.08	521.33	517.07	560.37	589.00	561.00	636.00	-	-	301.74

Variable: Abundance

EstLayer: 1

Stratum: 66

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	14	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	2058	2058	216.0	105.00
23-24	-	2058	-	-	-	-	-	-	-	-	-	-	-	-	2058	216.0	105.00
24-25	2138	4115	-	-	-	-	-	-	-	-	-	-	-	-	6253	832.7	133.15
25-26	-	34487	-	-	-	-	-	-	-	-	-	-	-	-	34487	4960.2	143.83
26-27	-	51592	-	-	-	-	-	-	-	-	-	-	-	-	51592	8020.9	155.47
27-28	-	12863	17415	-	-	-	-	-	-	-	-	-	-	-	30279	5239.6	173.05
28-29	-	11632	-	-	-	-	-	-	-	-	-	-	-	-	11632	2347.7	201.83
29-30	-	-	16937	-	-	-	-	-	-	-	-	-	-	-	16937	3691.7	217.97
30-31	-	-	20492	-	-	-	-	-	-	-	-	-	-	-	20492	4921.4	240.16
31-32	-	-	3288	1943	4912	-	-	-	-	-	-	-	-	-	10144	2774.6	273.53
32-33	-	-	-	3449	-	9241	-	-	-	-	-	-	-	-	12690	3664.8	288.78
33-34	-	-	-	2932	14645	-	-	-	-	-	-	-	-	-	17577	5659.0	321.95
34-35	-	-	-	-	8037	4634	1309	-	-	-	-	-	-	-	13979	4930.6	352.70
35-36	-	-	-	-	161	18657	6355	5151	-	-	-	-	-	-	30325	11297.0	372.54
36-37	-	-	-	-	-	9526	7680	6173	-	-	3443	-	-	-	26821	10817.6	403.33
37-38	-	-	-	-	-	10230	3483	2515	-	-	-	-	-	-	16228	6823.2	420.46
38-39	-	-	-	-	-	-	654	-	-	2356	17608	-	-	-	20619	9487.0	460.12
39-40	-	-	-	-	-	-	-	-	4135	-	-	-	-	-	4135	1955.5	472.87
40-41	-	-	-	-	-	-	-	-	-	-	-	10230	-	-	10230	5488.7	536.53
41-42	-	-	-	-	-	-	-	-	-	-	2138	161	81	-	2380	1280.9	538.20
42-43	-	-	-	-	-	-	-	-	-	-	574	-	-	-	574	351.1	612.00

43-44	-	-	-	-	-	-	-	-	-	-	-	-	81	-	81	53.9	669.00
TSN(1000)	2138	116747	58132	8325	27756	52288	19481	13839	4135	2356	23763	10391	161	2058	341569	-	-
TSB(1000 kg)	291.5	18244.8	12596.5	2365.5	8987.0	19346.0	7670.3	5578.5	1955.5	1028.8	11072.4	5579.1	98.3	216.0	-	95030.2	-
Mean length (cm)	24.00	25.89	28.87	32.12	32.95	34.95	35.79	35.81	39.00	38.00	38.08	40.02	42.00	22.00	-	-	-
Mean weight (g)	136.34	156.28	216.69	284.15	323.79	369.99	393.73	403.10	472.87	436.66	465.96	536.91	610.00	105.00	-	-	278.22

Variable: Abundance

EstLayer: 1

Stratum: 67

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
25-26	8547	-	-	-	-	-	-	-	8547	1118.3	130.85
26-27	40677	-	-	-	-	-	-	-	40677	6571.1	161.54
27-28	49959	-	-	-	-	-	-	-	49959	8815.0	176.44
28-29	24169	61373	-	-	-	-	-	-	85542	16840.6	196.87
29-30	21659	111637	-	-	-	-	-	-	133296	29423.2	220.74
30-31	-	128582	-	151	-	-	-	-	128733	32179.7	249.97
31-32	-	43244	43319	-	-	-	-	-	86563	22935.1	264.95
32-33	-	-	71828	-	-	-	-	-	71828	21185.5	294.95
33-34	-	19226	15697	-	-	-	13849	-	48772	15345.2	314.64
34-35	-	-	-	-	41772	16132	-	-	57904	19808.0	342.08
35-36	-	-	-	-	-	40810	-	-	40810	15490.7	379.58
36-37	-	-	-	-	-	-	10830	-	10830	4639.3	428.37
37-38	-	-	-	-	-	-	6339	-	6339	2462.7	388.48
38-39	-	-	-	-	-	-	5377	-	5377	2570.3	478.00
39-40	-	-	-	-	-	-	-	5377	5377	2694.0	501.00
TSN(1000)	145010	364063	130844	151	41772	56942	36395	5377	780554	-	-
TSB(1000 kg)	26077.2	86437.6	37511.5	36.9	14194.2	21104.6	14022.7	2694.0	-	202078.7	-
Mean length (cm)	27.07	29.63	31.79	30.00	34.00	34.72	35.33	39.00	-	-	-
Mean weight (g)	179.83	237.43	286.69	244.50	339.80	370.63	385.29	501.00	-	-	258.89

Variable: Abundance

EstLayer: 1

Stratum: 68

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	7	12	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
19-20	1349	-	-	-	-	-	-	-	1349	91.1	67.53
21-22	1364	-	-	-	-	-	-	-	1364	120.7	88.50
22-23	-	-	-	-	-	-	-	4078	4078	388.2	95.21
23-24	-	21694	-	-	-	-	-	-	21694	2422.5	111.67
24-25	8185	36582	-	-	-	-	-	-	44767	5601.0	125.11
25-26	-	57249	-	-	-	-	-	-	57249	8006.2	139.85
26-27	-	31153	-	-	-	-	-	-	31153	4755.1	152.64
27-28	-	17517	-	-	-	-	-	-	17517	2916.2	166.48
28-29	-	10500	9542	-	-	-	-	-	20041	3857.8	192.50
29-30	-	-	32190	-	-	-	-	-	32190	6724.8	208.91
30-31	-	-	28524	-	-	-	-	-	28524	6470.5	226.84
31-32	-	-	11888	-	-	-	-	-	11888	2945.8	247.80
32-33	-	-	667	-	-	-	-	-	667	178.8	268.00
33-34	-	-	2002	1649	667	-	-	-	4319	1325.4	306.91
34-35	-	-	-	-	3927	667	-	-	4594	1429.9	311.23
35-36	-	-	-	-	-	4947	-	-	4947	1780.2	359.84
36-37	-	-	-	-	1964	-	-	-	1964	782.5	398.50
43-44	-	-	-	-	-	-	982	-	982	520.3	530.00
TSN(1000)	10899	174695	84813	1649	6558	5615	982	4078	289288	-	-
TSB(1000 kg)	1234.3	24702.2	18786.1	515.9	2144.9	2025.2	520.3	388.2	-	50317.1	-
Mean length (cm)	23.01	25.10	29.62	33.00	34.50	34.88	43.00	22.00	-	-	-
Mean weight (g)	113.25	141.40	221.50	312.83	327.08	360.69	530.00	95.21	-	-	173.93

Variable: Abundance

EstLayer: 1

Stratum: 69

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	12	15	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22	1131	-	-	-	-	-	-	-	-	-	-	-	-	1131	88.2	78.00
22-23	-	-	-	-	-	-	-	-	-	-	-	-	8754	8754	730.5	83.44
23-24	6907	21087	-	-	-	-	-	-	-	-	-	-	-	27994	2880.4	102.89

24-25	1010	51083	-	-	-	-	-	-	-	-	-	-	-	52094	6012.3	115.41
25-26	-	114822	-	-	-	-	-	-	-	-	-	-	-	114822	14882.3	129.61
26-27	-	72684	-	-	-	-	-	-	-	-	-	-	-	72684	10576.2	145.51
27-28	-	32446	-	-	-	-	-	-	-	-	-	-	-	32446	5148.1	158.67
28-29	-	14726	8272	-	-	-	-	-	-	-	-	-	-	22997	4094.6	178.05
29-30	-	6203	22461	-	-	-	-	-	-	-	-	-	-	28664	5654.9	197.28
30-31	-	365	23856	3067	-	-	-	-	-	-	-	-	-	27288	6168.4	226.05
31-32	-	-	9099	17768	-	-	-	-	-	-	-	-	-	26868	6643.9	247.28
32-33	-	-	-	8545	-	-	-	-	-	-	-	-	-	8545	2208.6	258.47
33-34	-	-	-	2626	8459	363	-	-	-	-	-	-	-	11448	3224.3	281.64
34-35	-	-	-	1012	-	14746	8930	-	-	-	-	-	-	24688	7801.2	315.99
35-36	-	-	-	-	-	-	15611	-	-	-	-	-	-	15611	5457.2	349.58
36-37	-	-	-	-	-	4834	1739	8483	-	-	-	-	-	15057	5386.2	357.73
37-38	-	-	-	-	-	-	6676	719	498	-	360	-	-	8253	3206.5	388.55
38-39	-	-	-	-	-	-	-	-	5329	-	-	-	-	5329	2174.4	408.02
39-40	-	-	-	-	-	-	2495	-	1093	-	-	-	-	3589	1549.3	431.71
40-41	-	-	-	-	-	-	-	-	-	1098	-	1755	-	2852	1391.4	487.79
42-43	-	-	-	-	-	-	-	-	-	-	-	359	-	359	187.1	522.00
TSN(1000)	9049	313417	63687	33018	8459	19943	35451	9202	6921	1098	360	2113	8754	511473	-	-
TSB(1000 kg)	882.5	42640.9	13545.3	8373.9	2397.6	6513.9	12591.2	3269.2	2804.1	537.9	138.4	1040.7	730.5	-	95466.2	-
Mean length (cm)	22.86	25.37	29.53	31.42	33.00	34.47	35.46	36.08	38.09	40.00	37.00	40.34	22.00	-	-	-
Mean weight (g)	97.53	136.05	212.68	253.61	283.45	326.62	355.17	355.25	405.17	490.00	385.00	492.45	83.44	-	-	186.65

Variable: Abundance

EstLayer: 1

Stratum: 79

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	218	6880	442	-	-	-	-	-	-	-	-	7540	1946.1	258.09
31-32	-	17066	-	-	-	-	-	-	-	-	-	17066	4903.7	287.33
32-33	5600	436	-	22805	-	-	-	-	-	-	-	28840	9217.6	319.61
33-34	1065	-	7103	32150	-	-	-	-	-	-	-	40318	13228.6	328.10
34-35	-	-	4839	27821	46402	-	-	-	-	-	-	79061	28752.0	363.67
35-36	-	13662	2503	84000	17814	24429	-	-	-	-	-	142409	57446.7	403.39
36-37	-	-	-	40082	10993	79402	-	3893	-	-	-	134371	57930.7	431.12
37-38	-	-	2210	4030	37834	31843	1526	-	-	-	-	77441	34965.5	451.51
38-39	-	-	-	-	2833	1967	20346	443	715	-	-	26304	12884.7	489.83
39-40	-	-	-	-	1626	4259	3441	-	-	-	-	9326	4782.7	512.82

LenGrp		2	3	4	5	6	7	8	9	10	11	12	Number	Biomass	Mean W
40-41	|	-	-	-	-	-	-	6291	513	-	-	-	6804	3671.7	539.64
41-42	|	-	-	-	-	-	-	-	3029	-	-	-	3029	1914.6	632.00
42-43	|	-	-	-	-	-	-	-	-	-	2851	-	2851	1901.3	667.00
43-44	|	-	-	-	-	-	-	-	-	-	-	179	179	136.4	763.00
TSN(1000)	|	6883	38044	17097	210888	117503	141900	31603	7879	715	2851	179	575541	-	-
TSB(1000 kg)	|	2129.7	11901.8	6211.5	81992.8	48455.4	60608.2	15731.3	4265.1	348.7	1901.3	136.4	-	233682.4	-
Mean length (cm)	|	32.09	32.27	34.02	34.47	35.47	36.17	38.46	38.30	38.00	42.00	43.00	-	-	-
Mean weight (g)	|	309.44	312.84	363.31	388.80	412.38	427.12	497.77	541.33	487.60	667.00	763.00	-	-	406.02

Variable: Abundance

EstLayer: 1

Stratum: 80

SpecCat: MAKRELL

	age														
LenGrp		2	3	4	5	6	7	8	9	10	11	12	Number	Biomass	Mean W
													(1E3)	(1E3kg)	(g)
29-30	|	403	1049	-	-	-	-	-	-	-	-	-	1452	367.3	252.93
30-31	|	-	21740	-	-	-	-	-	-	-	-	-	21740	5625.9	258.78
31-32	|	4085	23515	28	-	-	-	-	-	-	-	-	27629	7700.4	278.71
32-33	|	2417	39255	-	28	-	-	-	-	-	-	-	41700	12510.9	300.02
33-34	|	-	14820	32449	13948	4170	-	-	-	-	-	-	65387	21847.2	334.12
34-35	|	-	-	41742	30412	32115	-	7149	-	-	-	-	111419	41740.2	374.62
35-36	|	-	-	47585	6465	48016	22269	-	-	-	6128	-	130463	49881.0	382.34
36-37	|	-	-	9220	-	11074	22631	43511	27224	-	-	-	113661	47963.6	421.99
37-38	|	-	-	-	-	33668	24963	8167	-	-	-	-	66798	30856.9	461.94
38-39	|	-	-	-	19460	4675	-	7421	-	-	-	-	31555	15559.9	493.10
39-40	|	-	-	-	-	-	-	8752	-	-	-	-	8752	4386.5	501.20
40-41	|	-	-	-	-	-	403	-	-	2722	-	-	3125	1711.3	547.58
41-42	|	-	-	-	-	-	-	-	-	-	-	403	403	238.4	592.00
TSN(1000)	|	6905	100380	131025	70313	133719	70266	75001	27224	2722	6128	403	624085	-	-
TSB(1000 kg)	|	1858.7	29557.1	46986.3	28226.6	55879.3	30024.9	32217.3	11453.7	1483.7	2463.5	238.4	-	240389.5	-
Mean length (cm)	|	31.23	31.45	34.26	35.00	35.39	36.06	36.47	36.00	40.00	35.00	41.00	-	-	-
Mean weight (g)	|	269.19	294.45	358.61	401.44	417.89	427.31	429.56	420.72	545.00	402.00	592.00	-	-	385.19

Variable: Abundance

EstLayer: 1

Stratum: 81

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	-	6825	-	-	-	-	-	-	-	-	-	6825	1527.5	223.81
30-31	10924	38548	-	-	-	-	-	-	-	-	-	49472	12181.4	246.23
31-32	14291	64313	-	3823	-	-	-	-	-	-	-	82427	22625.0	274.49
32-33	10560	24305	25982	43	9878	-	-	-	-	-	-	70768	21801.3	308.07
33-34	-	-	55254	-	-	-	-	-	-	-	-	55254	16886.9	305.62
34-35	-	8920	78788	30857	9189	2549	-	-	-	-	-	130302	45829.7	351.72
35-36	-	-	29082	33261	83606	-	-	-	-	-	-	145949	53675.4	367.77
36-37	-	-	20255	40867	5730	28808	14111	-	-	-	-	109771	45326.7	412.92
37-38	-	-	-	-	52571	12376	-	18388	-	-	-	83335	35651.5	427.81
38-39	-	-	-	5644	-	19796	43	-	-	-	-	25484	12559.7	492.85
39-40	-	-	-	-	-	6691	2822	5280	2640	-	-	17433	8653.3	496.39
40-41	-	-	-	-	-	2683	-	7965	-	-	-	10648	5582.6	524.28
41-42	-	-	-	-	-	-	4096	-	-	-	-	4096	2234.5	545.46
42-43	-	-	-	-	-	-	2640	-	-	1411	-	4051	2671.1	659.36
43-44	-	-	-	-	-	-	-	-	-	-	2640	2640	2045.9	775.00
44-45	-	-	-	-	-	-	-	-	1411	-	-	1411	1011.8	717.00
TSN(1000)	35775	142912	209361	114496	160974	72902	23713	31633	4051	1411	2640	799866	-	-
TSB(1000 kg)	9798.8	39477.7	71834.3	44308.1	61423.5	31595.0	11321.0	15351.3	2186.5	922.1	2045.9	-	290264.2	-
Mean length (cm)	30.99	30.99	33.82	35.10	35.45	37.07	37.89	38.09	40.74	42.00	43.00	-	-	-
Mean weight (g)	273.90	276.24	343.11	386.99	381.57	433.39	477.43	485.30	539.75	653.50	775.00	-	-	362.89

Variable: Abundance

EstLayer: 1

Stratum: 82

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	436	-	-	-	-	-	-	436	73.6	169.00
29-30	-	114895	-	-	-	-	-	114895	24117.0	209.91
30-31	-	218641	-	-	-	-	-	218641	51202.5	234.19
31-32	1743	169744	-	-	-	-	-	171487	45661.2	266.27
32-33	-	6288	6230	70700	-	-	-	83219	23694.1	284.72

33-34	-	-	94659	2139	-	-	-	96798	29997.0	309.89
34-35	-	-	49130	58335	4240	3180	19	114904	39300.5	342.03
35-36	-	-	37529	180285	7420	-	-	225234	85244.4	378.47
36-37	-	-	-	18020	65535	61169	2614	147338	59691.3	405.13
37-38	-	-	-	12720	49840	16319	1307	80186	33116.4	413.00
38-39	-	-	-	-	19440	5300	892	25632	12115.9	472.69
39-40	-	-	-	-	7506	5736	-	13241	6728.8	508.17
TSN(1000)	2179	509568	187548	342199	153980	91704	4832	1292010	-	-
TSB(1000 kg)	543.5	122158.1	61863.7	122532.8	64332.9	37378.5	2133.2	-	410942.8	-
Mean length (cm)	30.40	30.13	33.63	34.32	36.62	36.41	36.63	-	-	-
Mean weight (g)	249.48	239.73	329.86	358.07	417.80	407.60	441.43	-	-	318.06

Variable: Abundance

EstLayer: 1

Stratum: 83

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	10	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
5-6	-	-	-	-	-	-	-	-	773	773	-	-
28-29	617	1093	-	-	-	-	-	-	-	1710	333.6	195.14
29-30	-	14941	-	-	-	-	-	-	-	14941	3402.4	227.72
30-31	4917	26846	-	-	-	-	-	-	-	31763	7790.6	245.27
31-32	-	20575	2732	118	-	-	-	-	-	23425	6253.8	266.97
32-33	-	9351	1877	72	-	-	-	-	-	11299	3316.6	293.52
33-34	-	6181	142	7971	24	24	-	-	-	14342	4709.3	328.37
34-35	-	6181	4584	8735	122	3090	1545	-	-	24257	8873.3	365.80
35-36	-	-	6918	8168	10979	-	-	-	-	26065	9985.0	383.09
36-37	-	24	24	6181	10860	9389	24	-	-	26502	11248.6	424.44
37-38	-	-	-	6251	48	8687	5822	-	-	20808	8937.1	429.49
38-39	-	-	-	-	3685	-	-	-	-	3685	1717.9	466.24
39-40	-	-	-	-	-	-	-	2139	-	2139	1145.2	535.45
40-41	-	-	-	-	-	-	-	571	-	571	314.7	551.38
TSN(1000)	5534	85191	16277	37495	25717	21191	7391	2709	773	202279	-	-
TSB(1000 kg)	1336.6	22681.0	5519.3	14371.1	10754.9	8826.6	3078.8	1459.8	-	-	68028.2	-
Mean length (cm)	29.78	30.77	33.69	34.82	35.85	36.11	36.37	39.21	5.00	-	-	-
Mean weight (g)	241.52	266.24	339.09	383.28	418.20	416.53	416.54	538.80	-	-	-	337.60

Variable: Abundance

EstLayer: 1

Stratum: 84

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	14	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	298	-	-	-	-	-	-	-	-	-	-	-	-	298	55.2	185.40
27-28	1191	1446	-	-	-	-	-	-	-	-	-	-	-	2637	494.7	187.58
28-29	971	6952	-	-	-	-	-	-	-	-	-	-	-	7923	1781.6	224.85
29-30	8994	12946	-	-	-	-	-	-	-	-	-	-	-	21940	5084.7	231.75
30-31	-	33838	1786	-	-	-	-	-	-	-	-	-	-	35624	9105.1	255.59
31-32	209	12622	-	-	-	-	-	-	-	-	-	-	-	12831	3518.7	274.24
32-33	-	2847	1926	2026	-	-	-	-	-	-	-	-	-	6799	2094.1	308.02
33-34	-	2279	70	4631	251	-	-	-	-	-	-	-	-	7231	2463.9	340.76
34-35	-	-	4737	1909	1568	-	-	-	-	-	-	-	-	8214	2546.6	310.02
35-36	-	-	388	5818	3972	1649	826	-	-	-	-	-	-	12653	5345.9	422.51
36-37	-	-	907	594	10766	318	318	-	-	-	-	-	-	12903	5496.4	425.98
37-38	-	-	424	794	34	2255	2883	4020	265	-	-	-	-	10675	4950.8	463.77
38-39	-	-	-	-	2552	1057	907	1106	318	-	-	-	-	5941	2917.0	491.02
39-40	-	-	-	-	-	-	1552	2493	-	-	-	-	-	4045	2024.0	500.36
40-41	-	-	-	-	-	-	953	212	-	-	-	-	-	1165	680.3	584.11
41-42	-	-	-	-	-	-	53	-	-	234	181	390	-	859	509.7	593.11
42-43	-	-	-	-	181	53	-	-	-	181	181	-	-	597	373.6	625.27
43-44	-	-	-	-	-	-	-	-	-	-	640	-	-	640	437.6	684.27
44-45	-	-	-	-	-	-	-	-	-	-	-	-	298	298	194.7	654.00
TSN(1000)	11663	72930	10238	15772	19325	5332	7492	7831	583	416	1003	390	298	153273	-	-
TSB(1000 kg)	2504.4	18657.4	3075.3	6074.6	8392.4	2373.4	3681.6	3677.8	299.3	260.2	654.6	229.0	194.7	-	50074.6	-
Mean length (cm)	28.67	29.92	33.26	34.04	35.92	36.57	37.68	37.86	37.55	41.44	42.46	41.00	44.00	-	-	-
Mean weight (g)	214.73	255.83	300.38	385.16	434.28	445.12	491.38	469.64	513.37	625.49	652.91	586.65	654.00	-	-	326.70

Variable: Abundance

EstLayer: 1

Stratum: 85

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	Number	Biomass	Mean W

													(1E3)	(1E3kg)	(g)
23-24	-	2089	-	-	-	-	-	-	-	-	-	-	2089	234.0	112.00
24-25	1878	1878	-	-	-	-	-	-	-	-	-	-	3756	527.7	140.50
25-26	-	11242	-	-	-	-	-	-	-	-	-	-	11242	1734.6	154.30
26-27	-	63578	-	-	-	-	-	-	-	-	-	-	63578	10681.1	168.00
27-28	-	56402	-	-	-	-	-	-	-	-	-	-	56402	10524.2	186.59
28-29	-	10604	39416	-	-	-	-	-	-	-	-	-	50020	10667.6	213.27
29-30	-	13034	60475	-	-	-	-	-	-	-	-	-	73509	17823.6	242.47
30-31	-	12859	60132	8685	-	-	-	-	-	-	-	-	81677	21091.9	258.24
31-32	-	6861	75444	2271	-	-	-	-	-	-	-	-	84576	24287.5	287.17
32-33	-	-	33017	11992	13122	-	-	-	-	-	-	-	58131	17765.4	305.61
33-34	-	-	5222	36597	12082	4423	-	-	-	-	-	-	58324	20121.3	344.99
34-35	-	-	-	8280	18324	17557	8701	11201	-	-	-	-	64063	24201.3	377.77
35-36	-	-	-	-	59495	15682	20868	-	-	-	-	-	96045	39073.7	406.83
36-37	-	-	-	310	5271	27798	7172	4515	-	-	-	-	45065	19494.1	432.57
37-38	-	-	-	-	1767	-	17310	17823	-	-	-	-	36900	17540.3	475.35
38-39	-	-	-	-	-	5814	-	-	-	-	11017	-	16832	8291.9	492.64
39-40	-	-	-	-	-	-	-	1176	8795	4966	-	-	14936	7516.7	503.26
40-41	-	-	-	-	-	-	-	-	2094	-	-	-	2094	1209.5	577.68
41-42	-	-	-	-	-	-	-	-	2535	-	-	-	2535	1526.1	602.00
42-43	-	-	-	-	-	-	-	-	1122	-	370	-	1493	979.6	656.18
43-44	-	-	-	-	-	-	-	-	-	-	-	149	149	97.9	658.50
TSN(1000)	1878	178547	273707	68136	110061	71274	54051	34714	14546	4966	11388	149	823415	-	-
TSB(1000 kg)	287.3	33946.6	72059.2	22379.2	42211.2	29361.3	23739.6	15320.9	8322.6	1999.7	5664.6	97.9	-	255390.1	-
Mean length (cm)	24.00	27.01	30.07	32.51	34.34	35.26	35.61	35.97	39.72	39.00	38.13	43.00	-	-	-
Mean weight (g)	153.00	190.13	263.27	328.45	383.53	411.95	439.21	441.34	572.17	402.71	497.43	658.50	-	-	310.16

Variable: Abundance

EstLayer: 1

Stratum: 86

SpecCat: MAKRELL

	age										
LenGrp	2	3	4	5	6	7	8	11	Number	Biomass	Mean W
									(1E3)	(1E3kg)	(g)
24-25	13869	-	-	-	-	-	-	-	13869	1955.5	141.00
25-26	27737	-	-	-	-	-	-	-	27737	3966.4	143.00
26-27	83211	-	-	-	-	-	-	-	83211	13757.6	165.33
27-28	41606	13869	-	-	-	-	-	-	55474	10165.7	183.25
28-29	41606	-	-	-	-	-	-	-	41606	8695.6	209.00

29-30	-	345111	-	-	-	-	-	-	345111	80808.0	234.15
30-31	-	525524	-	-	-	-	-	-	525524	134347.3	255.64
31-32	-	104857	146926	-	-	-	-	-	251783	71123.3	282.48
32-33	-	55919	202773	-	-	-	-	-	258692	76603.6	296.12
33-34	-	-	166312	58803	-	-	-	-	225115	73197.2	325.15
34-35	-	-	-	176973	69343	-	-	43493	289809	106175.2	366.36
35-36	-	-	-	128146	167130	-	-	-	295276	113767.0	385.29
36-37	-	-	-	68346	55474	52590	121054	-	297464	122733.6	412.60
37-38	-	-	-	-	-	104857	14242	-	119099	52370.2	439.72
38-39	-	-	-	-	-	14242	31066	-	45308	19417.4	428.57
39-40	-	-	-	-	7121	7121	6213	-	20455	10228.4	500.05
40-41	-	-	-	-	-	-	19547	-	19547	9709.6	496.73
TSN(1000)	208029	1045280	516011	432269	299068	178810	192123	43493	2915082	-	-
TSB(1000 kg)	35545.2	264052.3	156626.3	162414.6	115992.7	77123.0	81268.7	15999.1	-	909021.7	-
Mean length (cm)	26.33	29.84	32.04	34.48	35.05	36.87	36.90	34.00	-	-	-
Mean weight (g)	170.87	252.61	303.53	375.73	387.85	431.31	423.00	367.86	-	-	311.83

Variable: Abundance

EstLayer: 1

Stratum: 87

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	6579	-	-	-	-	-	-	-	-	6579	1117.7	169.89
27-28	26244	1192	-	-	-	-	-	-	-	27436	4912.5	179.06
28-29	29265	-	36624	-	-	-	-	-	-	65889	13407.3	203.49
29-30	31527	114570	-	-	-	-	-	-	-	146097	32715.0	223.93
30-31	-	172106	48008	-	-	-	-	-	-	220114	53214.2	241.76
31-32	-	141064	-	-	-	-	-	-	-	141064	37088.4	262.92
32-33	-	-	52213	-	-	4006	-	-	-	56219	16088.7	286.18
33-34	-	4766	2664	33414	20553	-	-	-	-	61398	19358.0	315.29
34-35	-	-	1341	37427	10548	5965	-	-	-	55281	18643.8	337.26
35-36	-	-	12483	-	11220	14275	5691	-	-	43670	15929.9	364.78
36-37	-	-	-	-	-	4499	10773	-	-	15272	6002.7	393.05
37-38	-	-	-	-	14089	5157	4006	-	-	23252	9282.6	399.22
38-39	-	-	-	-	2383	4550	-	-	-	6933	2926.5	422.08
39-40	-	-	-	-	-	1341	-	3190	-	4531	2058.1	454.18
40-41	-	-	-	-	-	1192	-	-	5334	6526	3418.9	523.91

TSN(1000)	93615	433697	153335	70842	58794	40985	20469	3190	5334	880261	-	-
TSB(1000 kg)	18823.2	105844.0	40130.3	23222.7	20602.1	15328.5	7971.8	1452.0	2789.8	-	236164.4	-
Mean length (cm)	27.92	30.09	30.70	33.53	34.72	35.53	35.92	39.00	40.00	-	-	-
Mean weight (g)	201.07	244.05	261.72	327.81	350.41	374.01	389.45	455.10	523.00	-	-	268.29

Variable: Abundance

EstLayer: 1

Stratum: 88

SpecCat: MAKRELL

	age													
LenGrp	1	2	3	4	5	6	7	8	10	12	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22	2861	-	-	-	-	-	-	-	-	-	-	2861	214.6	75.00
22-23	-	-	-	-	-	-	-	-	-	-	5721	5721	489.2	85.50
23-24	-	4808	-	-	-	-	-	-	-	-	-	4808	555.3	115.50
24-25	-	38593	-	-	-	-	-	-	-	-	-	38593	4614.4	119.57
25-26	-	103942	-	-	-	-	-	-	-	-	-	103942	14075.2	135.41
26-27	-	141112	-	-	-	-	-	-	-	-	-	141112	21155.1	149.92
27-28	-	190151	5911	-	-	-	-	-	-	-	-	196062	32875.7	167.68
28-29	-	105722	37536	-	-	-	-	-	-	-	-	143258	26483.1	184.86
29-30	-	21388	74811	-	-	-	-	-	-	-	-	96199	20206.5	210.05
30-31	-	-	128227	-	-	-	-	-	-	-	-	128227	28855.3	225.03
31-32	-	-	34051	2774	-	-	-	-	-	-	-	36825	8709.5	236.51
32-33	-	-	13578	18598	-	-	-	-	-	-	-	32176	8188.4	254.49
33-34	-	-	-	-	13578	-	-	-	-	-	-	13578	3961.3	291.74
34-35	-	-	-	-	2722	-	4789	-	-	-	-	7510	2351.7	313.14
35-36	-	-	11174	-	-	4808	-	-	-	-	-	15982	5255.5	328.84
36-37	-	-	-	-	-	9914	-	-	-	-	-	9914	3456.4	348.64
37-38	-	-	-	-	-	1875	-	2404	-	2774	-	7053	2741.8	388.72
38-39	-	-	-	-	2774	-	-	-	4808	-	-	7582	3052.8	402.63
TSN(1000)	2861	605716	305288	21372	19074	16597	4789	2404	4808	2774	5721	991403	-	-
TSB(1000 kg)	214.6	95946.5	68152.2	5319.9	5892.9	5679.4	1535.3	1050.5	1937.6	1023.6	489.2	-	187241.7	-
Mean length (cm)	21.00	26.45	29.83	31.87	33.87	35.82	34.00	37.00	38.00	37.00	22.00	-	-	-
Mean weight (g)	75.00	158.40	223.24	248.92	308.96	342.19	320.62	437.00	403.00	369.00	85.50	-	-	188.87

Variable: Abundance

EstLayer: 1

Stratum: 89

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
21-22	1817	-	-	-	-	-	-	-	-	-	-	-	1817	141.7	78.00
22-23	-	-	-	-	-	-	-	-	-	-	-	2826	2826	246.6	87.27
23-24	7083	-	-	-	-	-	-	-	-	-	-	-	7083	745.9	105.31
24-25	1878	11419	-	-	-	-	-	-	-	-	-	-	13298	1569.3	118.02
25-26	-	45075	-	-	-	-	-	-	-	-	-	-	45075	6070.6	134.68
26-27	-	99361	-	-	-	-	-	-	-	-	-	-	99361	15003.3	151.00
27-28	-	64063	-	-	-	-	-	-	-	-	-	-	64063	10650.3	166.25
28-29	-	26616	5452	-	-	-	-	-	-	-	-	-	32068	5667.3	176.73
29-30	-	-	8840	-	-	-	-	-	-	-	-	-	8840	1794.7	203.03
30-31	-	-	7699	-	-	-	-	-	-	-	-	-	7699	1793.0	232.90
31-32	-	-	562	-	-	-	-	-	-	-	-	-	562	131.4	234.00
32-33	-	-	3696	-	-	-	-	-	-	-	-	-	3696	966.6	261.55
33-34	-	-	-	1123	562	-	-	-	-	-	-	-	1685	476.3	282.67
34-35	-	-	-	2941	-	-	-	-	-	-	-	-	2941	933.2	317.33
35-36	-	-	-	-	3195	-	1817	-	-	-	-	-	5012	1661.6	331.52
36-37	-	-	-	-	-	-	1685	1817	-	-	-	-	3502	1261.1	360.06
37-38	-	-	-	1817	755	1817	-	755	1817	-	-	-	6961	2590.7	372.15
38-39	-	-	-	-	-	562	-	-	562	562	-	-	1685	668.5	396.67
39-40	-	-	-	-	-	-	-	-	1317	-	-	-	1317	582.5	442.45
40-41	-	-	-	-	-	-	-	-	1817	755	-	-	2572	1251.8	486.71
42-43	-	-	-	-	-	-	-	-	-	-	562	-	562	294.9	525.00
44-45	-	-	-	-	-	-	-	-	-	-	755	-	755	463.5	614.00
TSN(1000)	10779	246534	26247	5881	4511	2379	3502	2572	5513	1317	1317	2826	313378	-	-
TSB(1000 kg)	1097.4	37767.8	5668.8	1890.9	1453.4	897.7	1279.2	920.0	2392.3	592.1	758.4	246.6	-	54964.7	-
Mean length (cm)	22.84	26.20	29.55	34.74	35.09	37.24	35.48	36.29	38.57	39.15	43.15	22.00	-	-	-
Mean weight (g)	101.81	153.20	215.98	321.51	322.16	377.35	365.25	357.70	433.96	449.73	576.03	87.27	-	-	175.39

Variable: Abundance

EstLayer: 1

Stratum: 97

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)

29-30	179	179	-	-	-	-	-	-	-	357	85.9	240.50
30-31	-	536	-	-	-	-	-	-	-	536	132.7	247.73
31-32	-	4307	-	-	-	-	-	-	-	4307	1164.2	270.27
32-33	-	-	-	-	-	-	3073	-	-	3073	968.1	315.01
33-34	-	5611	-	4577	-	-	-	-	-	10188	3653.4	358.59
34-35	-	-	21557	19410	4607	15273	-	-	-	60847	23040.9	378.67
35-36	-	1537	24071	12111	34193	2180	-	-	-	74093	28284.4	381.74
36-37	-	-	20316	36889	39600	33829	-	-	-	130635	56099.1	429.44
37-38	-	-	-	30483	31900	16918	17039	-	-	96340	43205.0	448.46
38-39	-	-	-	-	5719	47436	-	-	-	53155	25378.3	477.44
39-40	-	-	-	-	-	14193	-	-	-	14193	7080.4	498.86
40-41	-	-	-	-	-	5711	-	-	-	5711	3412.6	597.53
41-42	-	-	-	-	-	822	-	822	2887	4532	2651.0	585.01
42-43	-	-	-	-	-	-	2064	-	2064	4129	2567.1	621.75
TSN(1000)	179	12169	65945	103471	116019	136363	22176	822	4951	462095	-	-
TSB(1000 kg)	32.3	4012.6	25506.7	43510.1	49214.8	62395.8	9755.7	509.9	2785.1	-	197723.1	-
Mean length (cm)	29.00	32.35	34.98	35.67	36.00	37.09	36.77	41.00	41.42	-	-	-
Mean weight (g)	181.00	329.74	386.79	420.51	424.20	457.57	439.92	620.00	562.51	-	-	427.88

Variable: Abundance

EstLayer: 1

Stratum: 99

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	112	-	-	-	-	-	-	-	-	-	112	35.4	316.60
28-29	-	-	-	176	-	-	-	-	-	-	176	36.8	209.00
29-30	-	-	352	-	-	-	-	-	-	-	352	88.6	252.10
30-31	-	463	1311	112	-	-	-	-	-	-	1886	469.0	248.60
31-32	-	-	4088	575	-	-	-	-	-	-	4663	1282.0	274.95
32-33	-	-	-	7402	1920	-	-	-	-	-	9323	2886.3	309.59
33-34	-	-	-	4972	-	8389	-	-	-	-	13361	4568.7	341.95
34-35	-	-	-	11326	-	15059	-	-	-	-	26385	9189.6	348.29
35-36	-	-	-	-	15220	8239	-	-	-	-	23459	8768.3	373.77
36-37	-	-	-	-	9215	16013	-	-	-	-	25227	10474.2	415.19
37-38	-	-	-	-	-	7339	3273	1596	-	-	12207	5614.1	459.89
38-39	-	-	1196	-	-	2357	1401	-	957	-	5911	2793.0	472.51
39-40	-	-	-	-	-	-	-	2069	-	-	2069	904.9	437.39

40-41	-	-	-	-	-	-	-	176	-	-	176	90.6	514.50
41-42	-	-	-	-	-	-	-	-	576	-	576	329.8	572.57
42-43	-	-	-	-	-	-	176	-	-	-	176	127.3	722.50
43-44	-	-	-	-	-	204	-	-	-	352	556	392.3	705.37
TSN(1000)	112	463	6947	24563	26355	57600	4850	3841	1533	352	126615	-	-
TSB(1000 kg)	35.4	106.2	2062.6	7896.5	9973.4	22907.4	2226.3	1823.0	776.5	243.5	-	48050.9	-
Mean length (cm)	23.00	30.00	31.92	33.06	35.13	35.13	37.47	38.22	39.13	43.00	-	-	-
Mean weight (g)	316.60	229.18	296.92	321.48	378.42	397.70	459.00	474.67	506.65	692.50	-	-	379.50

Variable: Abundance

EstLayer: 1

Stratum: 100

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	3625	6025	-	-	-	-	-	-	-	-	-	-	9650	2164.9	224.33
30-31	7088	42034	264	-	-	-	-	-	-	-	-	-	49386	12339.8	249.86
31-32	3727	72669	2856	-	-	-	-	-	-	-	-	-	79252	21673.4	273.47
32-33	2856	25370	23471	7305	846	2775	-	-	-	-	-	-	62623	18163.4	290.04
33-34	-	7725	17048	24860	9731	-	772	-	-	-	-	-	60136	19552.4	325.14
34-35	-	2201	19042	29732	12105	6803	-	1169	-	165	-	-	71217	25090.4	352.31
35-36	-	583	13116	29089	39285	16271	1857	846	-	1169	-	-	102215	38809.6	379.69
36-37	-	3264	5444	12235	34281	27417	14913	583	1169	264	-	-	99568	41382.7	415.62
37-38	-	-	-	3515	24817	31657	19336	9322	-	-	-	-	88646	39742.0	448.32
38-39	-	-	-	344	8021	12421	3263	1011	3098	927	-	-	29084	14152.6	486.61
39-40	-	-	-	1929	1169	1077	2179	2678	747	-	-	-	9779	4936.9	504.86
40-41	-	-	-	-	428	329	329	1169	329	-	-	-	2585	1380.0	533.85
41-42	-	-	-	-	165	165	1929	-	165	-	583	165	3170	1858.0	586.03
42-43	-	-	-	-	-	-	-	-	-	-	583	-	583	337.9	580.00
TSN(1000)	17296	159871	81241	109008	130848	98915	44580	16776	5508	2524	1165	165	667895	-	-
TSB(1000 kg)	4394.3	44232.1	26941.3	39649.5	52287.5	41875.8	19840.5	7955.0	2525.8	1100.1	690.0	92.1	-	241583.9	-
Mean length (cm)	30.34	31.07	33.39	34.33	35.62	36.21	36.88	37.24	37.92	36.14	41.50	41.00	-	-	-
Mean weight (g)	254.07	276.67	331.62	363.73	399.61	423.35	445.06	474.19	458.60	435.92	592.25	559.00	-	-	361.71

Variable: Abundance

EstLayer: 1

Stratum: 103

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	678	-	-	-	-	-	-	-	678	214.1	315.60
34-35	678	678	678	-	-	-	-	-	2035	729.3	358.33
35-36	-	5456	6106	-	-	-	-	-	11562	4575.1	395.71
36-37	1357	-	13569	5512	2770	678	-	-	23886	10528.5	440.77
37-38	-	8141	-	10290	10855	-	-	-	29286	13930.0	475.66
38-39	-	-	57	15124	-	-	-	-	15180	7166.9	472.13
39-40	-	-	-	311	5456	4127	-	-	9894	5287.6	534.42
40-41	-	-	-	3619	3534	-	-	-	7152	4220.2	590.06
41-42	-	-	-	-	-	-	1753	-	1753	1121.0	639.44
42-43	-	-	-	933	-	848	-	-	1781	1091.7	612.85
43-44	-	-	85	-	85	-	57	-	226	155.2	685.38
44-45	-	-	-	-	-	-	707	-	707	491.5	695.50
45-46	-	-	-	-	-	-	-	28	28	25.5	902.00
TSN(1000)	2714	14275	20494	35788	22699	5654	2516	28	104170	-	-
TSB(1000 kg)	987.2	6101.4	8442.1	17528.3	11643.2	3155.2	1653.7	25.5	-	49536.7	-
Mean length (cm)	34.50	36.09	35.67	37.72	37.85	39.09	41.89	45.00	-	-	-
Mean weight (g)	363.80	427.41	411.92	489.78	512.93	558.06	657.17	902.00	-	-	475.54

Variable: Abundance

EstLayer: 1

Stratum: 104

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	13	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
6-7	-	-	-	-	-	-	-	-	-	-	-	179	179	-	-
29-30	3002	-	-	-	-	-	-	-	-	-	-	-	3002	627.1	208.87
30-31	600	2102	-	-	300	-	-	-	-	-	-	-	3002	775.8	258.38
31-32	-	2402	-	2746	-	-	-	-	-	-	-	-	5148	1425.8	276.97
32-33	-	2102	1201	-	-	-	-	-	-	-	-	-	3303	981.3	297.14
33-34	-	-	2102	3002	-	-	-	-	-	-	-	-	5104	1756.7	344.17
34-35	-	-	1801	11042	9797	-	-	-	-	-	-	-	22640	8321.4	367.55

35-36	-	-	-	29349	35654	-	895	-	-	-	-	-	65898	27672.9	419.94
36-37	-	-	1501	48915	41894	26859	-	1201	-	-	-	-	120371	53466.6	444.18
37-38	-	-	-	300	22278	24162	53807	-	-	-	-	-	100547	47627.8	473.69
38-39	-	-	1074	-	1316	23867	22849	-	-	-	-	-	49106	25353.7	516.30
39-40	-	-	-	6681	-	10083	6144	-	5192	-	-	-	28101	14699.7	523.11
40-41	-	-	-	-	-	-	1195	1074	14975	1253	-	-	18497	10603.0	573.25
41-42	-	-	-	-	-	3647	895	-	-	5607	-	-	10149	6333.3	624.03
42-43	-	-	-	-	1074	-	-	-	-	2446	-	-	3520	2303.4	654.45
43-44	-	-	-	-	-	-	-	-	-	-	179	-	179	128.3	717.00
TSN(1000)	3603	6605	7679	102036	112314	88618	85785	2275	20167	9306	179	179	438745	-	-
TSB(1000 kg)	779.3	1807.7	3034.0	44050.1	48207.6	44654.7	41356.4	1174.8	11246.1	5637.9	128.3	-	-	202076.9	-
Mean length (cm)	29.17	31.00	34.36	35.47	35.77	37.36	37.47	37.89	39.74	41.13	43.00	6.00	-	-	-
Mean weight (g)	216.31	273.67	395.10	431.71	429.22	503.90	482.10	516.46	557.66	605.83	717.00	-	-	-	460.77

Variable: Abundance

EstLayer: 1

Stratum: 105

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	12	15	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
6-7	-	-	-	-	-	-	-	-	-	37	37	-	-
30-31	5079	-	-	-	-	-	-	-	-	-	5079	1381.6	272.00
31-32	2796	-	-	-	-	-	-	-	-	-	2796	777.2	278.00
32-33	555	2511	139	-	139	-	-	-	-	-	3344	1140.8	341.15
33-34	1142	5283	602	7644	-	-	-	-	-	-	14671	4974.2	339.05
34-35	-	-	1630	24527	18152	-	-	-	-	-	44308	16644.1	375.64
35-36	1316	12409	41295	15982	12867	2116	-	-	-	-	85985	35081.3	407.99
36-37	-	-	979	47555	31521	577	12037	-	-	-	92668	41470.3	447.51
37-38	-	-	1288	28509	4154	26336	-	-	-	-	60287	29381.1	487.35
38-39	-	343	268	8159	-	13347	6029	-	-	-	28146	14692.7	522.01
39-40	-	-	-	-	2834	1712	4852	-	-	-	9398	4723.8	502.63
40-41	-	-	-	-	1461	-	1572	-	-	-	3033	1762.2	580.98
41-42	-	-	-	-	-	-	-	2811	-	-	2811	1712.8	609.28
42-43	-	-	-	-	-	2021	-	-	-	-	2021	1343.6	664.71
45-46	-	-	-	-	-	-	-	-	128	-	128	104.2	814.50
TSN(1000)	10888	20546	46200	132376	71128	46109	24490	2811	128	37	354713	-	-
TSB(1000 kg)	3248.8	8288.2	18850.2	58069.0	30524.1	22692.3	11700.3	1712.8	104.2	-	-	155189.8	-
Mean length (cm)	31.28	34.17	35.02	35.67	35.56	37.48	37.34	41.00	45.00	6.00	-	-	-

Mean weight (g)	|	298.39	403.39	408.01	438.67	429.14	492.14	477.76	609.28	814.50	-	-	-	437.55

Variable: Abundance

EstLayer: 1

Stratum: 106

SpecCat: MAKRELL

LenGrp	age	2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	|	1277	-	-	-	-	-	-	-	-	-	1277	247.8	194.00
28-29	|	8240	-	-	-	-	-	-	-	-	-	8240	1629.3	197.74
29-30	|	-	52520	-	-	-	-	-	-	-	-	52520	12352.9	235.20
30-31	|	-	78772	-	-	-	-	-	-	-	-	78772	19679.1	249.82
31-32	|	-	75492	-	-	-	-	-	-	-	-	75492	20317.6	269.13
32-33	|	-	8626	30870	1487	-	-	-	-	-	-	40983	12102.5	295.31
33-34	|	-	9172	21052	20969	2365	-	-	-	-	-	53559	17084.9	318.99
34-35	|	-	-	8933	22366	28728	561	-	-	-	-	60588	21205.4	349.99
35-36	|	-	850	7174	26479	15998	8544	-	-	-	-	59045	22445.1	380.14
36-37	|	-	-	-	3564	4999	21628	7438	-	-	-	37629	15106.5	401.46
37-38	|	-	-	-	-	7791	12163	-	5903	-	-	25857	10977.4	424.54
38-39	|	-	-	-	-	-	3274	6252	-	-	1133	10659	4851.7	455.17
39-40	|	-	-	-	-	-	-	-	2940	-	-	2940	1408.1	478.99
40-41	|	-	-	-	-	-	-	-	-	767	-	767	427.8	558.00
41-42	|	-	-	-	-	-	-	-	767	-	-	767	441.6	576.00
TSN(1000)	|	9517	225433	68028	74866	59882	46170	13690	9609	767	1133	509094	-	-
TSB(1000 kg)	|	1877.1	58135.2	22026.2	26381.1	21735.5	18760.2	5968.0	4404.1	427.8	562.6	-	160277.7	-
Mean length (cm)	|	27.87	30.32	32.89	34.13	34.78	36.20	36.91	37.93	40.00	38.00	-	-	-
Mean weight (g)	|	197.24	257.88	323.78	352.38	362.97	406.33	435.94	458.32	558.00	496.50	-	-	314.83

Variable: Abundance

EstLayer: 1

Stratum: 107

SpecCat: MAKRELL

LenGrp	age	2	3	4	5	6	7	8	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)

24-25	|	1691	-	-	-	-	-	-	-	-	1691	208.0	123.00
25-26	|	1691	-	-	-	-	-	-	-	-	1691	233.3	138.00
26-27	|	28690	-	-	-	-	-	-	-	-	28690	4933.2	171.95
27-28	|	70668	-	-	-	-	-	-	-	-	70668	12731.7	180.16
28-29	|	68564	28589	-	-	-	-	-	-	-	97153	19241.6	198.05
29-30	|	55138	42666	-	-	-	-	-	-	-	97804	20830.7	212.98
30-31	|	9110	112213	-	-	-	-	-	-	-	121323	28737.4	236.87
31-32	|	-	61346	-	-	-	-	-	-	-	61346	15361.8	250.41
32-33	|	-	-	21776	-	-	-	-	-	-	21776	5859.0	269.06
33-34	|	-	1586	-	8959	-	-	-	-	-	10545	3208.9	304.30
34-35	|	-	-	-	3315	9939	-	-	-	-	13254	4344.0	327.75
35-36	|	-	-	-	525	5765	2656	-	-	-	8947	2996.0	334.88
36-37	|	-	-	-	265	4616	13536	-	-	-	18417	6598.6	358.28
37-38	|	-	-	-	-	795	3584	12769	-	-	17148	6845.1	399.18
38-39	|	-	-	-	-	-	-	957	-	-	957	383.3	400.53
39-40	|	-	-	-	-	-	689	-	-	-	689	303.9	441.00
40-41	|	-	-	-	-	-	-	-	-	957	957	478.3	499.82
41-42	|	-	-	-	-	-	-	-	268	-	268	134.2	501.00
TSN(1000)	|	235552	246401	21776	13064	21116	20466	13726	268	957	573324	-	-
TSB(1000 kg)	|	45930.5	56809.4	5859.0	4102.2	7146.5	7483.6	5485.4	134.2	478.3	-	133428.9	-
Mean length (cm)	|	27.72	29.86	32.00	33.39	34.82	36.15	37.07	41.00	40.00	-	-	-
Mean weight (g)	|	194.99	230.56	269.06	314.01	338.44	365.67	399.64	501.00	499.82	-	-	232.73

Variable: Abundance

EstLayer: 1

Stratum: 108

SpecCat: MAKRELL

	age												
LenGrp		2	3	4	5	6	7	8	9	Unknown	Number	Biomass	Mean W
											(1E3)	(1E3kg)	(g)
22-23	|	-	-	-	-	-	-	-	-	7574	7574	727.1	96.00
24-25	|	15148	-	-	-	-	-	-	-	-	15148	1863.2	123.00
25-26	|	53018	-	-	-	-	-	-	-	-	53018	7558.9	142.57
26-27	|	298188	-	-	-	-	-	-	-	-	298188	46755.1	156.80
27-28	|	730620	-	-	-	-	-	-	-	-	730620	122728.3	167.98
28-29	|	391345	-	-	-	-	-	-	-	-	391345	71330.7	182.27
29-30	|	185327	58958	-	-	-	-	-	-	-	244285	48090.5	196.86
30-31	|	59415	101309	-	-	-	-	-	-	-	160724	35811.7	222.82
31-32	|	-	33177	-	-	-	-	-	-	-	33177	7636.0	230.16

32-33	|	-	11940	1149	-	-	-	-	-	-	13089	3441.0	262.90
33-34	|	-	575	575	575	-	-	-	-	-	1724	548.6	318.33
34-35	|	-	-	-	8149	-	-	-	-	-	8149	2828.1	347.07
35-36	|	-	-	-	-	575	575	-	-	-	1149	425.7	370.50
36-37	|	-	-	-	-	-	11940	-	-	-	11940	3701.3	310.00
37-38	|	-	-	-	-	-	-	-	8149	-	8149	3344.8	410.48
38-39	|	-	-	-	-	-	-	7574	-	-	7574	4158.1	549.00
TSN(1000)	|	1733062	205958	1724	8723	575	12514	7574	8149	7574	1985851	-	-
TSB(1000 kg)	|	299594.6	45477.3	492.9	3027.4	218.9	3908.2	4158.1	3344.8	727.1	-	360949.3	-
Mean length (cm)	|	27.28	30.00	32.33	33.93	35.00	35.95	38.00	37.00	22.00	-	-	-
Mean weight (g)	|	172.87	220.81	286.00	347.06	381.00	312.30	549.00	410.48	96.00	-	-	181.76

Variable: Abundance

EstLayer: 1

Stratum: 109

SpecCat: MAKRELL

		age												
LenGrp		2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
25-26	|	7202	-	-	-	-	-	-	-	-	-	7202	1058.8	147.00
26-27	|	96607	-	-	-	-	-	-	-	-	-	96607	15889.0	164.47
27-28	|	297135	5134	-	-	-	-	-	-	-	-	302270	53320.5	176.40
28-29	|	115823	21671	-	-	-	-	-	-	-	-	137494	26446.5	192.35
29-30	|	64319	28790	-	-	-	-	-	-	-	-	93109	19914.9	213.89
30-31	|	-	133804	-	-	-	-	-	-	-	-	133804	31567.7	235.93
31-32	|	-	49811	-	-	-	-	-	-	-	-	49811	12580.0	252.55
32-33	|	-	27102	-	-	-	-	-	-	-	-	27102	7264.1	268.02
33-34	|	-	-	14994	14780	-	-	-	-	-	-	29774	9080.1	304.97
34-35	|	-	-	-	7810	20546	-	-	-	-	-	28355	9441.0	332.95
35-36	|	-	-	-	11106	4922	8014	-	-	-	-	24042	8922.0	371.10
36-37	|	-	-	-	14940	10030	5960	9820	-	-	-	40751	16294.9	399.86
37-38	|	-	-	-	-	3156	41787	-	-	-	-	44943	19767.7	439.84
38-39	|	-	-	-	-	-	13411	1057	-	423	-	14891	6730.2	451.96
39-40	|	-	-	-	-	-	-	-	18242	-	-	18242	9492.0	520.33
40-41	|	-	-	-	-	-	2448	-	2448	-	2448	7345	4073.9	554.67
41-42	|	-	-	-	-	-	-	-	5117	-	-	5117	3382.2	661.01
TSN(1000)	|	581086	266313	14994	48636	38654	71620	10878	25807	423	2448	1060860	-	-
TSB(1000 kg)	|	105050.2	62991.2	4619.6	16893.7	14173.2	31335.2	4376.5	14250.1	169.4	1366.1	-	255225.4	-
Mean length (cm)	|	27.23	30.06	33.00	34.54	34.89	36.98	36.19	39.49	38.00	40.00	-	-	-

Mean weight (g)	180.78	236.53	308.08	347.35	366.67	437.52	402.34	552.17	400.50	558.00	-	-	240.58

Variable: Abundance

EstLayer: 1

Stratum: 118

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	226	-	-	-	-	-	-	-	-	226	65.7	290.50
32-33	-	-	113	-	-	-	-	-	-	113	31.9	281.60
33-34	-	113	113	-	-	-	-	-	-	226	69.4	306.65
34-35	-	566	452	-	113	-	-	-	-	1131	401.6	355.02
35-36	-	452	566	-	-	-	-	452	-	1470	589.8	401.09
36-37	-	-	2303	1511	1059	-	-	-	-	4873	1948.0	399.73
37-38	-	226	-	1932	1027	606	41	-	-	3833	1779.5	464.25
38-39	-	-	452	113	1059	606	113	-	-	2344	1141.7	487.10
39-40	-	-	-	-	1244	679	-	-	-	1923	1014.6	527.62
40-41	-	-	-	-	-	679	-	-	-	679	335.4	494.20
41-42	-	-	-	-	-	-	-	113	113	226	125.5	554.70
42-43	-	-	113	-	-	-	-	-	113	226	142.3	629.05
44-45	-	-	-	-	113	-	-	-	113	226	147.6	652.50
TSN(1000)	226	1357	4113	3557	4615	2570	154	566	339	17497	-	-
TSB(1000 kg)	65.7	518.9	1665.7	1548.8	2214.5	1256.4	76.1	238.2	208.4	-	7792.8	-
Mean length (cm)	31.00	34.75	35.83	36.61	37.64	38.56	37.73	36.20	42.33	-	-	-
Mean weight (g)	290.50	382.31	405.00	435.47	479.81	488.84	494.54	421.20	614.10	-	-	445.37

Variable: Abundance

EstLayer: 1

Stratum: 120

SpecCat: MAKRELL

LenGrp	age 5	6	7	8	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	-	28	-	-	-	28	9.5	340.60

36-37	28	28	-	-	-	56	23.2	415.50
37-38	-	-	28	28	-	56	25.0	447.90
40-41	-	-	-	-	28	28	12.8	457.60
TSN(1000)	28	56	28	28	28	167	-	-
TSB(1000 kg)	12.3	20.3	11.9	13.1	12.8	-	70.4	-
Mean length (cm)	36.00	35.50	37.00	37.00	40.00	-	-	-
Mean weight (g)	442.00	364.80	426.20	469.60	457.60	-	-	420.83

Variable: Abundance

EstLayer: 1

Stratum: 121

SpecCat: MAKRELL

LenGrp	age 7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
36-37	22	-	22	9.6	434.00
38-39	22	22	44	21.2	478.40
40-41	-	22	22	12.7	573.60
TSN(1000)	44	44	89	-	-
TSB(1000 kg)	20.4	23.1	-	43.5	-
Mean length (cm)	37.00	39.00	-	-	-
Mean weight (g)	459.70	522.50	-	-	491.10

Variable: Abundance

EstLayer: 1

Stratum: 122

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	11	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	-	-	28	-	-	-	-	-	-	28	8.5	306.20
35-36	-	56	-	-	-	-	-	-	-	56	22.2	397.70
36-37	-	56	-	28	-	-	-	-	-	84	33.6	401.00
37-38	-	-	-	84	56	-	-	-	-	140	67.9	486.56

38-39	|	-	-	56	56	80	-	-	-	-	192	96.6	503.76
39-40	|	28	-	-	80	28	28	28	-	-	192	100.5	523.83
40-41	|	-	-	56	-	-	28	56	28	-	167	96.5	576.35
41-42	|	-	-	-	56	-	80	-	28	-	164	97.9	597.32
42-43	|	-	-	-	28	84	-	28	-	-	140	94.1	674.48
43-44	|	-	-	-	-	-	-	-	-	28	28	20.2	725.50
45-46	|	-	-	-	-	-	-	-	-	28	28	20.1	721.50
TSN(1000)	|	28	112	140	331	248	136	112	56	56	1217	-	-
TSB(1000 kg)	|	14.9	44.1	69.2	178.4	139.0	76.4	64.0	31.9	40.4	-	658.2	-
Mean length (cm)	|	39.00	35.50	38.00	38.66	39.24	40.38	40.25	40.50	44.00	-	-	-
Mean weight (g)	|	534.00	395.00	496.02	538.43	561.17	561.69	572.98	571.70	723.50	-	-	540.72

Variable: Abundance

EstLayer: 1

Stratum: 123

SpecCat: MAKRELL

LenGrp	age	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	|	56	-	-	-	-	-	-	-	-	56	14.9	267.00
33-34	|	-	132	-	-	-	-	-	-	-	132	45.1	340.90
34-35	|	-	56	-	-	-	-	-	-	-	56	20.2	362.40
35-36	|	-	21	334	42	-	-	-	-	111	509	202.7	398.57
36-37	|	-	822	63	42	835	21	-	-	-	1783	769.8	431.72
37-38	|	-	-	1225	752	278	-	105	-	-	2361	1108.6	469.54
38-39	|	-	-	-	63	63	1031	334	-	-	1491	740.0	496.26
39-40	|	56	63	167	411	-	745	21	21	-	1484	780.1	525.77
40-41	|	-	-	-	-	-	299	-	411	-	710	397.5	559.73
41-42	|	-	-	-	-	-	-	411	-	-	411	236.6	576.06
42-43	|	-	-	223	21	-	-	-	-	-	244	144.8	594.08
TSN(1000)	|	111	1094	2012	1332	1177	2096	871	432	111	9236	-	-
TSB(1000 kg)	|	44.8	444.6	976.2	645.1	532.0	1073.1	456.6	239.2	48.7	-	4460.4	-
Mean length (cm)	|	34.50	35.69	37.36	37.65	36.34	38.62	39.32	39.95	35.00	-	-	-
Mean weight (g)	|	402.00	406.45	485.26	484.36	452.10	511.96	524.08	553.91	437.60	-	-	482.93

Variable: Abundance

EstLayer: 1

Stratum: 124

SpecCat: MAKRELL

LenGrp (age)	3	4	5	6	7	8	9	10	11	12	13	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	271	-	-	-	-	-	-	-	-	-	-	-	271	59.7	220.00
32-33	42	-	-	-	-	-	-	-	-	-	-	-	42	11.7	278.00
34-35	-	-	702	-	-	-	-	-	-	-	-	-	702	238.2	339.17
35-36	-	2331	2715	399	-	-	-	-	-	-	-	-	5444	2077.9	381.66
36-37	-	1901	3300	4674	2079	-	1086	-	-	-	-	-	13038	5708.9	437.86
37-38	-	-	-	1767	5454	1942	2965	-	-	-	-	-	12128	5543.9	457.13
38-39	-	-	-	3302	2303	126	882	638	-	-	-	-	7251	3676.1	506.96
39-40	-	-	-	-	4077	1037	-	43	83	-	-	-	5240	2718.6	518.86
40-41	-	-	-	1086	957	83	478	2444	-	-	-	-	5048	2731.2	541.01
41-42	-	-	-	-	1144	1140	-	718	43	-	42	-	3086	1820.1	589.81
42-43	-	-	-	-	-	718	43	42	42	-	-	-	845	565.9	669.94
43-44	-	-	-	-	-	351	-	-	-	80	-	-	431	279.2	647.98
44-45	-	-	-	-	80	-	-	-	271	-	-	-	351	221.8	631.48
45-46	-	-	-	-	-	-	-	-	-	-	-	80	80	64.9	814.50
TSN(1000)	314	4232	6717	11227	16093	5397	5454	3884	439	80	42	80	53958	-	-
TSB(1000 kg)	71.4	1708.2	2743.7	5270.4	7936.1	2946.5	2576.7	2070.6	250.8	56.2	22.8	64.9	-	25718.3	-
Mean length (cm)	29.40	35.45	35.39	37.10	38.02	39.35	37.27	39.87	42.57	43.00	41.00	45.00	-	-	-
Mean weight (g)	227.80	403.67	408.49	469.45	493.12	545.92	472.42	533.13	570.81	705.50	549.00	814.50	-	-	476.64

Variable: Abundance

EstLayer: 1

Stratum: 125

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	12	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
25-26	662	-	-	-	-	-	-	-	-	-	-	662	120.4	182.00
28-29	3578	-	-	-	-	-	-	-	-	-	-	3578	804.1	224.75
29-30	-	6432	-	-	-	-	-	-	-	-	-	6432	1548.1	240.68
30-31	-	30445	-	-	-	-	-	-	-	-	-	30445	7804.2	256.34
31-32	-	27340	-	-	-	-	-	-	-	-	-	27340	7449.5	272.48
32-33	-	11063	13378	-	-	-	-	-	-	-	-	24441	7191.7	294.25

33-34	-	-	2359	9423	3719	-	-	-	-	-	-	15501	5121.9	330.42
34-35	-	-	-	26407	-	-	2503	-	-	-	-	28910	10173.0	351.88
35-36	-	-	1414	19209	14203	5396	1293	3771	-	-	-	45286	17140.6	378.50
36-37	-	-	-	11368	15945	11398	4064	2822	-	-	-	45596	18507.0	405.89
37-38	-	-	-	1895	6970	23646	11110	3522	1413	-	-	48556	20884.1	430.11
38-39	-	-	-	-	-	3415	7489	4746	3297	-	-	18947	8723.7	460.43
39-40	-	-	-	-	-	2023	-	-	2444	-	-	4467	2252.6	504.27
40-41	-	-	-	-	4558	-	1909	476	-	1255	-	8198	4355.5	531.30
41-42	-	-	-	-	-	-	-	1612	478	1438	-	3528	1982.4	561.90
42-43	-	-	-	-	-	-	-	-	-	-	459	459	299.6	653.00
TSN(1000)	4239	75280	17151	68301	45395	45878	28368	16948	7632	2692	459	312345	-	-
TSB(1000 kg)	924.5	20016.8	5305.2	24760.3	18426.9	19387.8	12191.4	7837.3	3693.2	1515.4	299.6	-	114358.5	-
Mean length (cm)	27.53	30.57	32.38	34.56	36.00	36.68	36.97	37.13	38.32	40.53	42.00	-	-	-
Mean weight (g)	218.08	265.90	309.32	362.51	405.93	422.59	429.75	462.43	483.92	562.90	653.00	-	-	366.13

Variable: Abundance

EstLayer: 1

Stratum: 126

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	10	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	10694	-	-	-	-	-	-	-	-	10694	1914.8	179.05
27-28	34655	-	-	-	-	-	-	-	-	34655	6658.7	192.14
28-29	44300	-	-	-	-	-	-	-	-	44300	9082.6	205.03
29-30	87266	71280	-	-	-	-	-	-	-	158546	36627.3	231.02
30-31	12520	171130	-	-	-	-	-	-	-	183650	45545.2	248.00
31-32	-	167932	-	-	-	-	-	-	-	167932	44724.0	266.32
32-33	-	30365	20355	-	3205	-	-	-	-	53924	15291.0	283.56
33-34	-	-	16022	-	-	-	-	-	-	16022	5021.2	313.39
34-35	-	-	-	22392	-	-	-	-	-	22392	7941.8	354.67
35-36	-	-	-	2375	14345	404	-	-	-	17124	6394.8	373.45
36-37	-	-	-	4410	19224	4410	-	-	-	28045	10945.5	390.29
37-38	-	805	-	-	10429	-	3045	-	-	14278	5800.3	406.23
38-39	-	-	-	-	4224	413	-	-	-	4637	2107.7	454.56
39-40	-	-	-	-	-	-	-	2151	-	2151	1266.8	589.00
40-41	-	-	-	-	-	-	812	-	-	812	419.1	516.00
44-45	-	-	-	-	-	-	-	-	812	812	531.2	654.00
TSN(1000)	189435	441511	36377	29177	51427	5227	3857	2151	812	759974	-	-

TSB(1000 kg)	40596.6	112777.9	10881.9	10522.0	19902.5	2143.0	1650.2	1266.8	531.2	-	200272.0	-
Mean length (cm)	28.30	30.37	32.44	34.38	35.84	36.08	37.63	39.00	44.00	-	-	-
Mean weight (g)	214.30	255.44	299.15	360.63	387.01	409.95	427.87	589.00	654.00	-	-	263.52

Variable: Abundance

EstLayer: 1

Stratum: 127

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	1260	-	-	-	-	-	-	-	-	-	1260	234.3	186.00
27-28	15439	-	-	-	-	-	-	-	-	-	15439	3036.0	196.65
28-29	74733	-	-	-	-	-	-	-	-	-	74733	16411.5	219.60
29-30	70870	65112	-	-	-	-	-	-	-	-	135982	31038.8	228.26
30-31	33315	146751	-	-	-	-	-	-	-	-	180066	45464.3	252.49
31-32	-	134235	34198	-	-	-	-	-	-	-	168433	44992.1	267.12
32-33	-	67664	-	-	-	-	-	-	-	-	67664	19087.8	282.10
33-34	-	3779	-	-	12449	-	-	-	-	-	16228	5027.8	309.82
34-35	-	-	17270	7594	6273	-	-	-	-	-	31138	10119.6	324.99
35-36	-	5027	-	40395	-	8650	-	-	-	-	54072	18853.3	348.67
36-37	-	-	-	8639	15536	11298	-	-	-	-	35473	13389.8	377.47
37-38	-	-	-	-	-	3779	2519	1260	-	-	7558	2831.9	374.67
38-39	-	-	-	-	-	-	5039	-	-	-	5039	2092.4	415.25
39-40	-	-	1260	-	-	-	1260	-	2519	-	5039	2334.3	463.25
40-41	-	-	-	-	-	-	-	2458	2523	-	4980	2528.7	507.71
42-43	-	-	-	-	-	-	-	-	-	2461	2461	1641.5	667.00
TSN(1000)	195616	422569	52728	56629	34258	23727	8818	3718	5042	2461	805566	-	-
TSB(1000 kg)	43929.8	109645.7	15585.4	19785.4	11853.3	8929.3	3495.7	1588.4	2629.6	1641.5	-	219084.1	-
Mean length (cm)	28.61	30.57	32.17	35.02	34.54	35.79	37.86	38.98	39.50	42.00	-	-	-
Mean weight (g)	224.57	259.47	295.58	349.39	346.00	376.34	396.43	427.26	521.53	667.00	-	-	271.96

Variable: Abundance

EstLayer: 1

Stratum: 128

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
23-24	366	-	-	-	-	-	-	-	-	-	-	-	-	366	40.8	111.56
25-26	-	2587	-	-	-	-	-	-	-	-	-	-	-	2587	391.0	151.15
26-27	-	5665	-	-	-	-	-	-	-	-	-	-	-	5665	952.7	168.19
27-28	-	32753	-	-	-	-	-	-	-	-	-	-	-	32753	6047.8	184.65
28-29	-	80552	-	-	-	-	-	-	-	-	-	-	-	80552	16084.4	199.68
29-30	-	59107	32469	-	-	-	-	-	-	-	-	-	-	91576	19835.3	216.60
30-31	-	6036	56599	-	-	-	-	-	-	-	-	-	-	62634	15198.8	242.66
31-32	-	-	18350	9035	-	-	-	-	-	-	-	-	-	27384	7070.6	258.20
32-33	-	-	10384	-	-	-	-	-	-	-	-	-	-	10384	2941.6	283.27
33-34	-	-	-	5328	2663	-	-	-	-	-	-	-	-	7991	2432.9	304.46
34-35	-	-	-	2949	6441	-	1420	-	-	-	-	-	-	10810	3633.6	336.12
35-36	-	-	-	-	5519	6129	3260	-	-	-	-	-	-	14908	5410.8	362.94
36-37	-	-	-	-	2496	5644	10749	152	-	-	-	-	-	19041	7388.2	388.02
37-38	-	-	-	-	1814	2906	3884	2249	6347	-	888	-	-	18086	7197.9	397.97
38-39	-	-	-	-	-	1020	1752	3255	-	189	118	-	-	6334	2832.6	447.19
39-40	-	-	-	-	-	-	1230	1404	-	207	-	-	-	2841	1333.1	469.22
40-41	-	-	-	-	-	-	1179	702	561	3181	-	-	-	5624	2994.5	532.49
41-42	-	-	-	-	-	-	-	-	749	192	1273	192	-	2405	1456.2	605.50
42-43	-	-	-	-	-	-	-	402	-	-	-	-	-	402	259.3	645.39
43-44	-	-	-	-	-	-	-	-	-	-	1605	-	156	1761	1216.5	690.69
44-45	-	-	-	-	-	-	-	-	-	-	1388	-	-	1388	942.6	679.00
47-48	-	-	-	-	-	-	-	-	-	-	-	-	93	93	76.3	819.00
TSN(1000)	366	186700	117801	17312	18933	15699	23473	8164	7657	3768	5272	192	250	405587	-	-
TSB(1000 kg)	40.8	37584.3	28541.8	5004.7	6718.5	6128.3	9354.8	3666.3	3272.9	1940.8	3218.7	100.6	165.0	-	105737.6	-
Mean length (cm)	23.00	28.10	30.06	32.13	34.70	35.92	36.41	38.23	37.61	39.90	41.66	41.00	44.49	-	-	-
Mean weight (g)	111.56	201.31	242.29	289.09	354.86	390.37	398.53	449.07	427.44	515.03	610.52	525.50	661.04	-	-	260.70

Variable: Abundance

EstLayer: 1

Stratum: 143

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1577	-	-	-	-	-	-	-	-	-	1577	397.6	252.17
31-32	508	-	-	-	-	-	-	-	-	-	508	128.1	252.00

32-33	-	-	1525	-	-	-	-	-	-	-	1525	435.2	285.33
33-34	-	-	1017	508	-	-	-	-	-	-	1525	499.8	327.67
34-35	-	-	2188	-	-	-	-	-	-	-	2188	745.2	340.49
35-36	-	-	4067	2638	-	-	-	-	-	-	6706	2441.9	364.16
36-37	1525	223	-	3051	8643	-	-	-	-	-	13442	5419.8	403.20
37-38	-	-	1209	3184	6743	2631	2542	-	-	-	16310	6899.4	423.02
38-39	-	141	-	134	401	2034	-	-	3051	-	5759	2656.6	461.25
39-40	-	-	134	1525	-	-	89	-	-	-	1748	822.2	470.35
40-41	-	-	-	-	141	508	-	-	-	-	649	303.4	467.41
41-42	-	-	45	89	1017	-	-	-	-	-	1150	640.5	556.76
42-43	-	-	-	89	45	-	-	-	-	89	223	133.1	597.60
43-44	-	-	-	-	-	45	-	45	-	-	89	56.3	632.50
TSN(1000)	3611	363	10185	11219	16989	5218	2631	45	3051	89	53401	-	-
TSB(1000 kg)	1171.0	150.2	3614.2	4578.9	7113.3	2332.3	1115.2	27.7	1422.6	53.9	-	21579.2	-
Mean length (cm)	32.68	36.77	34.45	36.43	36.79	37.73	37.07	43.00	38.00	42.00	-	-	-
Mean weight (g)	324.31	413.39	354.85	408.15	418.69	446.97	423.83	621.00	466.33	604.50	-	-	404.10

Variable: Abundance

EstLayer: 1

Stratum: 144

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	3466	-	-	-	-	-	-	-	3466	669.8	193.23
27-28	8101	-	-	-	-	-	-	-	8101	1777.8	219.45
28-29	24918	8005	-	-	-	-	-	-	32923	7430.0	225.68
29-30	9574	62338	-	-	-	-	-	-	71911	17443.7	242.57
30-31	-	161719	-	-	-	-	-	-	161719	44142.7	272.96
31-32	-	96647	-	-	12120	-	-	-	108768	31782.1	292.20
32-33	-	43617	-	-	-	-	-	-	43617	13800.1	316.40
33-34	-	7168	-	42046	43011	-	-	-	92225	31488.3	341.43
34-35	-	19313	24141	21552	32540	1880	-	-	99424	35914.8	361.23
35-36	-	-	13060	90730	43764	-	-	2291	149846	58833.9	392.63
36-37	-	-	1264	24707	42932	41502	31290	-	141696	58829.6	415.18
37-38	-	-	26736	39454	56232	1268	2535	19536	145761	63940.1	438.67
38-39	-	-	-	9850	38670	27509	-	-	76029	34450.2	453.12
39-40	-	-	-	-	4891	8331	14674	-	27897	12807.4	459.10
40-41	-	-	-	-	-	14859	-	643	15502	7616.7	491.34
42-43	-	-	-	-	-	-	-	4963	4963	2342.5	472.00

TSN(1000)	46059	398806	65202	228339	274160	95348	48499	27433	1183847	-	-
TSB(1000 kg)	10272.8	112591.9	25391.7	89642.7	110015.8	42125.3	20742.8	12486.7	-	423269.8	-
Mean length (cm)	27.88	30.51	35.47	35.12	35.45	37.44	36.96	37.81	-	-	-
Mean weight (g)	223.03	282.32	389.43	392.59	401.28	441.81	427.69	455.17	-	-	357.54

Variable: Abundance

EstLayer: 1

Stratum: 145

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	4610	-	-	-	-	-	-	-	-	-	4610	930.6	201.87
28-29	12024	-	-	-	-	-	-	-	-	-	12024	2654.5	220.76
29-30	26318	15073	-	-	-	-	-	-	-	-	41391	9762.7	235.87
30-31	1924	42278	-	-	-	-	-	-	-	-	44202	11527.3	260.79
31-32	-	77299	-	-	-	-	-	-	-	-	77299	21368.3	276.44
32-33	-	36182	16801	-	-	-	-	-	-	-	52983	15716.0	296.62
33-34	-	10294	7736	4106	-	-	5147	-	-	-	27283	9094.4	333.34
34-35	-	5287	5927	6116	8549	-	-	-	-	-	25880	9232.1	356.72
35-36	-	-	13046	10889	6713	-	-	-	-	-	30649	11327.2	369.58
36-37	-	305	-	29830	4661	-	-	-	-	-	34795	14183.1	407.61
37-38	-	-	-	1340	15364	1650	20701	-	-	-	39054	16559.8	424.02
38-39	-	-	-	-	717	3140	9702	-	-	-	13560	6341.1	467.64
39-40	-	-	-	-	-	4034	-	2930	-	-	6964	3331.0	478.32
40-41	-	-	-	-	-	-	-	285	2668	-	2952	1519.8	514.78
41-42	-	-	-	-	-	-	-	-	-	77	77	44.0	572.00
42-43	-	-	-	-	-	77	-	-	-	-	77	53.9	701.00
43-44	-	-	-	-	-	-	272	-	-	-	272	217.9	801.00
TSN(1000)	44876	186719	43510	52281	36005	8901	35822	3215	2668	77	414072	-	-
TSB(1000 kg)	10195.1	52046.4	14312.5	20196.3	14036.2	4293.6	15840.8	1519.4	1379.2	44.0	-	133863.6	-
Mean length (cm)	28.57	31.01	33.35	35.35	35.81	38.30	36.74	39.09	40.00	41.00	-	-	-
Mean weight (g)	227.18	278.74	328.95	386.30	389.84	482.40	442.21	472.63	517.00	572.00	-	-	323.29

Variable: Abundance

EstLayer: 1

Stratum: 146

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	3612	-	-	-	-	-	-	-	3612	698.9	193.50
28-29	14448	6630	-	-	-	-	-	-	21077	4672.6	221.69
29-30	48656	36624	-	-	-	-	-	-	85279	20047.8	235.08
30-31	44843	100073	-	-	-	-	-	-	144916	37131.7	256.23
31-32	-	170044	12686	-	-	-	-	-	182731	49900.3	273.08
32-33	-	118800	8172	-	-	-	-	-	126973	37090.8	292.12
33-34	-	54476	14836	-	-	-	-	-	69312	21391.5	308.63
34-35	-	9839	-	14840	6753	-	-	-	31432	11249.6	357.90
35-36	-	-	3605	21931	7114	-	-	-	32650	11846.2	362.82
36-37	-	-	3556	5899	27365	3814	5478	-	46113	18247.3	395.71
37-38	-	-	-	-	9846	12407	-	-	22253	9731.4	437.30
38-39	-	-	-	-	24510	-	-	-	24510	11447.9	467.07
39-40	-	-	-	-	-	4997	-	2287	7284	3859.1	529.82
TSN(1000)	111558	496486	42856	42670	75588	21219	5478	2287	798142	-	-
TSB(1000 kg)	26764.4	137069.6	13544.7	15340.8	31460.5	9719.1	2230.4	1185.7	-	237315.1	-
Mean length (cm)	29.21	31.13	32.63	34.79	36.51	37.29	36.00	39.00	-	-	-
Mean weight (g)	239.91	276.08	316.05	359.52	416.21	458.05	407.15	518.50	-	-	297.33

Variable: Abundance

EstLayer: 1

Stratum: 147

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	7	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	3329	-	-	-	-	-	-	3329	572.7	172.00
27-28	29313	-	-	-	-	-	-	29313	5695.6	194.31
28-29	86519	-	-	-	-	-	-	86519	18308.3	211.61
29-30	123125	36021	-	-	-	-	-	159146	37339.7	234.63
30-31	23035	148866	-	-	-	-	-	171902	43404.3	252.49
31-32	4630	134826	-	-	-	-	-	139456	38442.9	275.66
32-33	-	59571	-	-	-	-	-	59571	17341.5	291.11
33-34	8117	-	8419	-	-	-	-	16536	5226.0	316.04

34-35	-	-	11481	1869	-	-	-	13350	4464.8	334.45
35-36	-	5852	-	5146	-	-	-	10999	3794.9	345.03
36-37	-	-	-	-	5096	-	-	5096	1862.7	365.52
37-38	-	-	-	-	6100	-	-	6100	2636.6	432.25
38-39	-	-	-	-	-	1641	-	1641	694.3	423.00
39-40	-	-	-	-	1176	-	-	1176	513.7	437.00
44-45	-	-	-	-	-	-	1176	1176	906.3	771.00
TSN(1000)	278067	385136	19900	7015	12371	1641	1176	705307	-	-
TSB(1000 kg)	63454.1	102110.0	6492.6	2533.8	5013.0	694.3	906.3	-	181204.2	-
Mean length (cm)	28.68	30.64	33.58	34.73	36.78	38.00	44.00	-	-	-
Mean weight (g)	228.20	265.13	326.26	361.19	405.21	423.00	771.00	-	-	256.92

Variable: Abundance

EstLayer: 1

Stratum: 148

SpecCat: MAKRELL

	age											
LenGrp	2	3	4	5	6	7	8	10	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	916	-	-	-	-	-	-	-	-	916	143.6	156.88
27-28	2780	-	-	-	-	-	-	-	-	2780	538.1	193.58
28-29	7329	-	-	-	-	-	-	-	-	7329	1493.8	203.81
29-30	9792	11643	-	-	-	-	-	-	-	21435	4783.2	223.14
30-31	13175	19065	-	-	-	-	-	-	-	32240	8009.2	248.43
31-32	5341	36719	-	-	-	-	-	-	-	42060	11511.3	273.69
32-33	8076	5697	3653	-	-	-	-	-	-	17426	5069.7	290.92
33-34	-	1786	4662	-	-	-	-	-	-	6448	2057.1	319.02
34-35	-	266	967	2385	-	-	-	-	-	3618	1213.5	335.37
35-36	-	-	-	-	4568	2377	-	-	-	6945	2515.2	362.16
36-37	-	-	1787	-	6046	-	-	-	-	7833	3149.2	402.02
37-38	-	-	-	-	3020	3224	1000	-	-	7244	3173.7	438.12
38-39	-	-	-	3600	933	904	467	-	-	5904	2814.2	476.69
39-40	-	-	-	-	-	745	468	468	-	1680	881.7	524.69
40-41	-	-	-	-	-	-	1871	-	-	1871	1132.3	605.12
41-42	-	-	-	-	-	-	702	-	-	702	429.9	612.67
42-43	-	-	-	-	-	-	229	558	-	787	514.3	653.45
43-44	-	-	-	-	-	-	-	-	906	906	663.5	732.00
TSN(1000)	47409	75176	11070	5985	14568	7249	4736	1026	906	168125	-	-
TSB(1000 kg)	11436.3	19712.8	3512.9	2462.5	5843.7	3186.9	2681.9	593.1	663.5	-	50093.6	-

Mean length (cm)	29.68	30.57	33.24	36.41	36.02	36.67	39.32	40.63	43.00	-	-	-
Mean weight (g)	241.23	262.22	317.34	411.46	401.13	439.63	566.28	578.23	732.00	-	-	297.95

Variable: Abundance

EstLayer: 1

Stratum: 162

SpecCat: MAKRELL

age															
LenGrp	2	3	4	5	6	7	8	9	10	12	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	451	451	-	-	-	-	-	-	-	-	-	-	903	240.5	266.50
30-31	-	1354	-	-	-	-	-	-	-	-	-	-	1354	379.1	280.00
31-32	-	451	-	-	-	-	-	-	-	-	-	-	451	129.5	287.00
32-33	-	903	451	451	-	-	-	-	-	-	-	-	1805	606.1	335.75
33-34	-	-	-	-	3159	-	-	-	-	-	-	-	3159	1122.3	355.29
34-35	-	-	-	-	-	6515	-	-	-	-	-	-	6515	2456.7	377.07
35-36	-	-	1354	-	5867	4769	-	-	-	-	-	-	11989	4861.3	405.48
36-37	-	-	-	-	9054	2228	30	-	987	-	-	-	12300	5319.5	432.50
37-38	-	-	-	1354	4092	7617	820	-	60	-	-	-	13944	6346.8	455.17
38-39	-	-	-	-	2003	2087	683	653	-	-	-	-	5425	2650.2	488.47
39-40	-	-	-	-	-	2710	30	30	-	-	-	-	2770	1427.8	515.41
40-41	-	-	-	-	-	1495	-	228	30	-	-	-	1753	984.6	561.74
41-42	-	-	-	-	-	451	30	228	30	30	30	30	830	493.0	594.21
42-43	-	-	-	-	395	-	60	-	197	60	-	-	713	437.4	613.41
44-45	-	-	-	-	-	30	-	-	-	-	-	-	30	20.8	691.00
TSN(1000)	451	3159	1805	1805	24569	27903	1654	1138	1305	90	30	30	63940	-	-
TSB(1000 kg)	119.6	915.6	704.4	788.4	10491.4	12349.7	778.2	594.4	642.5	56.7	16.9	17.8	-	27475.6	-
Mean length (cm)	29.00	30.57	34.25	35.75	35.80	36.38	37.69	39.03	37.16	41.67	41.00	41.00	-	-	-
Mean weight (g)	265.00	289.86	390.25	436.75	427.02	442.59	470.60	522.27	492.15	626.33	560.00	589.00	-	-	429.71

Variable: Abundance

EstLayer: 1

Stratum: 163

SpecCat: MAKRELL

age													
LenGrp	2	3	4	5	6	7	8	9	10	13	14	Number	Biomass	Mean W

												(1E3)	(1E3kg)	(g)
27-28	1061	-	-	-	-	-	-	-	-	-	-	1061	236.6	223.00
28-29	2122	4243	-	-	-	-	-	-	-	-	-	6365	1631.5	256.33
29-30	-	1633	-	-	-	7425	-	-	-	-	-	9058	2400.9	265.04
30-31	-	11345	-	-	5304	-	-	-	-	-	-	16649	4835.2	290.43
31-32	-	2940	7425	-	-	-	-	-	-	-	-	10365	3136.8	302.64
32-33	-	-	-	17137	-	-	-	-	-	-	-	17137	5603.1	326.96
33-34	-	6610	-	5388	9547	-	-	-	-	-	-	21545	8139.0	377.77
34-35	-	-	9466	1749	-	653	-	-	-	-	-	11868	4541.9	382.69
35-36	-	-	980	4162	5957	9385	-	-	349	-	-	20833	8377.5	402.13
36-37	-	-	-	5142	7030	2623	116	233	-	-	-	15143	6504.9	429.57
37-38	-	-	-	-	-	407	6841	-	-	-	-	7248	3331.2	459.61
38-39	-	-	-	-	-	291	1526	-	1351	-	-	3168	1565.8	494.27
39-40	-	-	-	-	-	1177	465	-	-	-	-	1642	840.1	511.60
40-41	-	-	-	-	-	-	-	501	58	58	-	617	358.5	580.74
41-42	-	-	-	-	-	1562	58	-	-	-	-	1620	997.7	615.88
42-43	-	-	-	-	-	-	-	-	-	-	233	233	142.4	612.50
TSN(1000)	3182	26771	17871	33578	27837	23522	9006	734	1758	58	233	144551	-	-
TSB(1000 kg)	787.1	8202.7	6272.8	12068.1	10606.7	9062.3	4219.6	402.9	849.6	28.8	142.4	-	52643.0	-
Mean length (cm)	27.67	30.47	32.81	33.25	33.61	33.86	37.29	38.73	37.47	40.00	42.00	-	-	-
Mean weight (g)	247.33	306.41	351.00	359.40	381.02	385.26	468.53	549.24	483.20	496.00	612.50	-	-	364.18

Variable: Abundance

EstLayer: 1

Stratum: 164

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	67	-	-	-	-	-	-	-	-	-	-	-	67	14.7	219.00
28-29	4358	-	-	-	-	-	-	-	-	-	-	-	4358	974.1	223.50
29-30	16417	11921	-	-	-	-	-	-	-	-	-	-	28337	7075.0	249.67
30-31	10897	55882	-	-	-	-	-	-	-	-	-	-	66779	18517.8	277.30
31-32	-	84546	-	-	-	-	-	-	-	-	-	-	84546	25157.4	297.56
32-33	-	8663	11856	-	-	-	-	-	-	-	-	-	20519	6418.7	312.81
33-34	-	-	4798	7237	1249	-	-	-	-	-	-	-	13284	4659.9	350.80
34-35	-	-	-	10195	11591	10285	-	-	-	-	-	-	32071	11854.3	369.62
35-36	-	-	65	6320	33676	-	9116	-	-	-	-	-	49176	19898.1	404.63
36-37	-	263	-	2919	11634	22970	5313	-	2440	-	-	-	45540	19493.4	428.05

37-38	-	-	-	329	10356	16317	2892	6556	-	4493	-	-	40942	18899.9	461.62
38-39	-	-	-	265	133	10191	3217	-	-	-	-	-	13806	6745.5	488.57
39-40	-	-	-	-	3014	-	-	949	3767	-	-	-	7730	3944.6	510.28
40-41	-	-	-	-	-	-	863	64	-	-	-	-	927	550.3	593.45
41-42	-	-	-	-	991	-	-	877	-	-	942	-	2810	1647.9	586.55
42-43	-	-	-	-	-	-	-	-	-	1089	-	-	1089	804.9	739.08
43-44	-	-	-	-	-	-	-	-	-	-	-	860	860	656.4	763.00
TSN(1000)	31739	161274	16719	27264	72644	59764	21402	8446	6207	5582	942	860	412843	-	-
TSB(1000 kg)	8222.0	46297.3	5459.4	10219.4	30113.9	26158.9	9440.1	4341.4	3028.8	2840.1	535.2	656.4	-	147312.8	-
Mean length (cm)	29.20	30.57	32.30	34.26	35.50	36.27	36.17	37.66	37.82	37.98	41.00	43.00	-	-	-
Mean weight (g)	259.05	287.07	326.54	374.82	414.54	437.71	441.08	514.04	487.96	508.82	568.41	763.00	-	-	356.83

Variable: Abundance

EstLayer: 1

Stratum: 165

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	611	-	-	-	-	-	-	-	-	-	611	133.2	218.00
28-29	611	611	-	-	-	-	-	-	-	-	1222	302.4	247.50
29-30	-	25950	-	-	-	-	-	-	-	-	25950	6681.3	257.47
30-31	39673	28482	-	-	-	-	-	-	-	-	68155	18515.4	271.67
31-32	17118	69991	1761	-	-	-	-	-	-	-	88871	25736.4	289.59
32-33	-	45539	-	-	-	-	-	-	-	-	45539	14539.2	319.27
33-34	-	6988	-	28925	1800	-	-	-	-	-	37712	13215.1	350.42
34-35	-	-	38118	34584	14507	-	-	-	-	-	87210	31620.3	362.58
35-36	-	-	12262	8199	63436	-	3458	-	-	-	87355	34207.8	391.59
36-37	-	-	8717	17947	36945	22713	-	-	-	-	86322	35929.8	416.23
37-38	-	598	-	-	15237	35215	-	6895	-	1196	59141	26899.9	454.84
38-39	-	-	-	-	3492	9091	3429	-	-	-	16012	7867.9	491.37
39-40	-	-	-	-	-	6816	3507	-	-	-	10323	5567.4	539.31
40-41	-	-	-	-	-	-	-	-	3622	-	3622	1917.9	529.50
41-42	-	-	-	-	-	-	3504	-	-	-	3504	2144.8	612.15
42-43	-	-	-	-	-	-	-	-	1693	-	1693	1027.5	607.00
44-45	-	-	-	-	-	-	-	-	-	1811	1811	1173.6	648.00
TSN(1000)	58013	178158	60858	89654	135418	73835	13898	6895	5315	3007	625052	-	-
TSB(1000 kg)	15955.2	52086.4	22563.3	33252.4	55379.3	33336.8	6872.8	3300.2	2945.4	1787.9	-	227479.6	-
Mean length (cm)	30.23	30.89	34.40	34.17	35.44	37.00	38.26	37.00	40.64	41.22	-	-	-

Mean weight (g)	275.03	292.36	370.75	370.90	408.95	451.51	494.52	478.67	554.18	594.50	-	-	363.94

Variable: Abundance

EstLayer: 1

Stratum: 166

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	33663	11243	-	-	-	-	-	-	-	-	44907	10132.1	225.63
29-30	163959	85755	-	-	-	-	-	-	-	-	249715	62210.1	249.12
30-31	112149	365975	-	-	-	-	-	-	-	-	478124	126464.9	264.50
31-32	56600	370890	3305	-	-	-	-	-	-	-	430796	125060.9	290.30
32-33	-	75867	26675	-	-	-	-	-	-	-	102542	32152.0	313.55
33-34	-	-	23925	5063	15980	-	-	-	-	-	44968	15029.0	334.21
34-35	-	-	10314	15741	9704	82594	-	-	-	-	118353	44783.4	378.39
35-36	-	-	5017	30154	67642	47730	-	-	-	-	150543	60160.9	399.63
36-37	-	-	613	-	30304	64558	-	-	-	-	95475	40140.0	420.42
37-38	-	-	-	13922	8490	16490	3396	-	-	-	42298	19734.4	466.56
38-39	-	-	-	-	-	28130	1229	-	-	-	29359	14745.9	502.26
39-40	-	-	-	-	-	9402	-	9402	-	-	18804	10802.6	574.50
40-41	-	-	-	-	-	-	-	-	7210	9419	16630	9371.0	563.51
41-42	-	-	-	-	-	-	-	-	11132	-	11132	6651.9	597.53
43-44	-	-	-	-	634	-	-	1731	-	-	2365	1684.3	712.26
TSN(1000)	366372	909731	69850	64879	132754	248904	4625	11132	18343	9419	1836009	-	-
TSB(1000 kg)	94439.0	251951.0	23678.0	25988.5	53971.7	104128.3	2240.5	6703.5	10625.7	5397.1	-	579123.5	-
Mean length (cm)	29.52	30.46	32.84	35.03	35.08	35.55	37.27	39.62	40.61	40.00	-	-	-
Mean weight (g)	257.77	276.95	338.98	400.57	406.55	418.35	484.47	602.17	579.29	573.00	-	-	315.43

Variable: Abundance

EstLayer: 1

Stratum: 167

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	11	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)

27-28	854	-	-	-	-	-	-	-	-	-	854	164.8	193.00
28-29	15077	-	-	-	-	-	-	-	-	-	15077	3362.6	223.03
29-30	22345	39159	-	-	-	-	-	-	-	-	61504	14836.3	241.23
30-31	8703	112978	7856	-	-	-	-	-	-	-	129538	34101.4	263.25
31-32	952	141535	-	-	-	-	-	-	-	-	142487	40684.7	285.53
32-33	-	79255	4905	-	-	-	-	-	-	-	84160	25647.3	304.75
33-34	-	-	-	-	21424	-	-	-	-	-	21424	7446.6	347.59
34-35	-	-	5735	45146	2485	-	-	-	-	-	53366	19172.8	359.27
35-36	-	-	15921	18996	34789	-	-	-	-	-	69706	27840.7	399.40
36-37	-	-	-	36561	26049	34919	-	-	-	-	97529	41712.2	427.69
37-38	-	-	-	24029	27640	12555	12288	-	-	-	76511	36132.8	472.26
38-39	-	-	-	-	3376	13776	3877	8039	-	-	29069	14868.1	511.47
39-40	-	-	-	-	-	12130	6761	-	-	-	18891	10544.1	558.15
40-41	-	-	-	-	-	3446	-	8843	-	-	12289	6970.8	567.26
41-42	-	-	-	-	-	3799	-	-	4872	-	8671	5276.0	608.48
42-43	-	-	-	-	-	-	-	-	-	4048	4048	2789.2	689.00
43-44	-	-	-	-	976	-	-	-	-	-	976	672.6	689.00
TSN(1000)	47931	372927	34416	124731	116740	80626	22926	16882	4872	4048	826098	-	-
TSB(1000 kg)	11471.5	103882.7	11878.7	51125.8	48231.1	38905.4	11355.5	9567.4	3015.5	2789.2	-	292222.9	-
Mean length (cm)	28.87	30.70	33.26	35.32	35.46	37.36	37.76	39.05	41.00	42.00	-	-	-
Mean weight (g)	239.33	278.56	345.15	409.89	413.15	482.54	495.32	566.74	619.00	689.00	-	-	353.74

Variable: Abundance

EstLayer: 1

Stratum: 168

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	621	-	-	-	-	-	-	-	-	-	-	-	621	136.3	219.60
29-30	2554	2435	-	-	-	-	-	-	-	-	-	-	4990	1162.4	232.97
30-31	-	24728	-	-	-	-	-	-	-	-	-	-	24728	6415.8	259.45
31-32	-	36596	-	-	-	-	-	-	-	-	-	-	36596	10039.7	274.34
32-33	-	26167	-	-	-	-	-	-	-	-	-	-	26167	7700.3	294.27
33-34	-	5503	-	4149	-	-	-	-	-	-	-	-	9652	3202.2	331.77
34-35	-	-	7798	15512	5848	-	-	-	-	-	-	-	29158	10426.5	357.59
35-36	-	-	25904	-	26217	-	-	-	-	-	-	-	52121	20035.6	384.41
36-37	-	1263	9737	3254	8145	19352	-	-	-	-	-	-	41750	17334.3	415.20
37-38	-	-	-	20389	22658	-	-	-	-	-	-	-	43047	19138.7	444.60

38-39	-	-	-	-	-	4381	14803	6450	-	-	-	-	25634	11930.9	465.44
39-40	-	-	-	-	-	11775	-	-	-	-	-	-	11775	6203.3	526.81
40-41	-	-	-	-	-	-	-	7094	-	-	-	-	7094	3947.3	556.41
41-42	-	-	-	-	-	-	-	-	-	-	5175	-	5175	3123.1	603.51
42-43	-	-	-	123	1038	123	-	-	-	-	-	-	1285	729.4	567.54
43-44	-	-	-	-	-	-	-	-	1162	123	124	1038	2448	1690.0	690.51
TSN(1000)	3175	96693	43438	43427	63906	35631	14803	13544	1162	123	5299	1038	322240	-	-
TSB(1000 kg)	733.7	27139.4	16643.7	17243.9	26406.6	16350.8	6947.6	6937.3	832.3	94.7	3210.2	675.9	-	123216.0	-
Mean length (cm)	28.80	31.14	35.04	35.49	35.86	37.26	38.00	39.05	43.00	43.00	41.05	43.00	-	-	-
Mean weight (g)	231.10	280.68	383.16	397.07	413.21	458.89	469.33	512.20	716.47	767.00	605.82	651.00	-	-	382.37

Variable: Abundance

EstLayer: 1

Stratum: 170

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	89	-	-	-	-	-	-	89	22.0	247.50
31-32	-	89	-	-	-	-	-	89	27.4	308.50
32-33	-	89	-	-	-	-	-	89	27.5	310.00
34-35	-	44	44	44	-	-	-	133	55.2	414.00
35-36	-	-	44	444	-	-	-	489	214.8	439.45
36-37	-	-	-	178	400	-	89	666	312.3	468.60
37-38	-	-	-	267	489	311	-	1066	547.1	513.08
38-39	-	-	-	-	267	89	-	355	191.9	540.00
39-40	-	-	-	-	89	-	222	311	181.8	584.57
40-41	-	-	-	-	-	133	-	133	84.2	632.00
42-43	-	-	-	-	-	-	44	44	36.4	820.00
TSN(1000)	89	222	89	933	1244	533	355	3465	-	-
TSB(1000 kg)	22.0	73.0	40.6	437.0	636.1	285.8	206.2	-	1700.7	-
Mean length (cm)	30.00	32.00	34.50	35.71	37.04	37.92	38.63	-	-	-
Mean weight (g)	247.50	328.60	457.00	468.33	511.36	536.00	580.25	-	-	490.76

Variable: Abundance

EstLayer: 1

Stratum: 182

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	-	195	-	-	-	-	-	-	-	-	-	195	58.0	297.00
31-32	195	586	-	-	-	-	-	-	-	-	-	781	231.5	296.25
32-33	-	724	-	391	-	-	-	-	-	-	-	1114	372.8	334.57
33-34	-	195	195	391	-	-	-	-	-	-	-	781	273.3	349.75
34-35	-	-	-	-	1758	1332	999	-	-	-	-	4089	1592.3	389.43
35-36	-	-	-	1368	1954	2779	781	999	1332	-	1665	10877	4471.9	411.13
36-37	-	-	-	1172	999	1780	4191	3387	-	-	-	11529	5061.9	439.05
37-38	-	-	-	195	781	977	4892	4856	333	586	-	12622	5948.1	471.27
38-39	-	-	-	-	-	-	-	5088	-	-	-	5088	2584.3	507.94
39-40	-	-	-	-	-	-	-	-	3720	-	-	3720	1990.0	534.94
40-41	-	-	-	-	-	-	1310	-	-	-	-	1310	710.8	542.67
41-42	-	-	-	-	724	-	-	-	-	-	-	724	448.5	619.75
TSN(1000)	195	1701	195	3517	6216	6868	12173	14330	5385	586	1665	52831	-	-
TSB(1000 kg)	56.7	545.7	70.7	1334.6	2667.0	2958.2	5505.5	6866.2	2718.5	260.2	760.1	-	23743.5	-
Mean length (cm)	31.00	31.54	33.00	34.89	35.83	35.35	36.60	36.98	37.89	37.00	35.00	-	-	-
Mean weight (g)	290.00	320.93	362.00	379.50	429.06	430.73	452.27	479.15	504.85	444.00	456.60	-	-	449.43

Variable: Abundance

EstLayer: 1

Stratum: 184

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	-	1928	-	-	-	-	-	-	-	-	1928	543.4	281.93
31-32	779	3425	-	-	-	-	-	-	-	-	4204	1237.2	294.28
32-33	-	-	-	1558	-	-	-	-	-	-	1558	509.5	327.10
33-34	-	-	-	7865	-	-	-	-	-	-	7865	2754.2	350.19
34-35	-	-	-	5374	2484	1420	518	740	-	-	10536	3963.1	376.14
35-36	-	-	-	-	14311	13924	2639	-	-	-	30875	12626.9	408.97
36-37	-	-	-	-	16177	25275	10277	-	-	-	51728	21523.5	416.09
37-38	-	-	-	-	7698	46276	-	-	6292	-	60266	27051.6	448.87
38-39	-	-	-	-	-	39406	-	-	-	-	39406	18723.7	475.15

39-40	-	-	148	-	1431	6947	803	2235	1431	-	12995	6370.9	490.25
40-41	-	-	-	-	-	-	-	3010	1431	-	4441	2341.0	527.09
41-42	-	-	-	-	-	-	5097	-	-	-	5097	2985.7	585.79
42-43	-	-	-	1431	1431	-	148	-	148	148	3306	2034.0	615.26
43-44	-	-	-	-	-	-	-	1431	148	-	1579	1066.9	675.66
TSN(1000)	779	5353	148	16228	43533	133248	19482	7416	9450	148	235784	-	-
TSB(1000 kg)	228.3	1552.3	84.0	6078.2	18574.9	59550.9	8972.7	3880.2	4710.5	99.8	-	103731.8	-
Mean length (cm)	31.00	30.64	39.00	34.03	36.03	36.97	37.29	39.68	37.93	42.00	-	-	-
Mean weight (g)	293.17	290.00	568.00	374.55	426.68	446.92	460.56	523.24	498.49	675.00	-	-	439.94

Variable: Abundance

EstLayer: 1

Stratum: 185

SpecCat: MAKRELL

	age													
LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	395	-	-	-	-	-	-	-	-	-	-	-	395	105.2	266.50
31-32	-	4215	-	-	-	-	-	-	-	-	-	-	4215	1220.5	289.58
32-33	-	1041	1152	-	-	-	-	-	-	-	-	-	2192	665.1	303.34
33-34	-	-	8323	-	-	-	-	-	-	-	-	-	8323	2764.6	332.18
34-35	-	-	2534	13593	-	-	839	-	-	-	-	-	16966	6086.2	358.73
35-36	-	-	-	8714	22886	2220	3644	-	-	-	-	-	37464	14524.2	387.69
36-37	-	-	-	9120	18386	12345	2047	1334	-	-	-	-	43232	18085.9	418.35
37-38	-	-	-	-	6140	23985	9319	3111	-	-	-	-	42555	18846.1	442.87
38-39	-	-	-	-	4492	3501	2607	-	922	-	-	-	11523	5482.7	475.81
39-40	-	-	-	-	-	-	4870	806	-	-	-	-	5675	2776.7	489.28
40-41	-	-	-	-	1370	-	1165	-	-	-	1258	-	3793	2158.2	569.02
41-42	-	-	-	-	-	-	1973	-	-	-	-	-	1973	1251.0	634.12
42-43	-	-	-	-	-	-	-	-	-	-	-	811	811	530.9	654.34
43-44	-	-	-	-	-	-	-	-	-	790	-	-	790	494.0	625.00
TSN(1000)	395	5256	12008	31427	53274	42051	26463	5251	922	790	1258	811	179906	-	-
TSB(1000 kg)	105.2	1532.0	4025.5	12038.8	22341.5	18280.4	12171.3	2354.5	432.2	494.0	685.1	530.9	-	74991.3	-
Mean length (cm)	30.00	31.20	33.12	34.86	35.96	36.68	37.45	37.05	38.00	43.00	40.00	42.00	-	-	-
Mean weight (g)	266.50	291.50	335.22	383.07	419.37	434.72	459.93	448.41	468.76	625.00	544.71	654.34	-	-	416.84

Variable: Abundance

EstLayer: 1

Stratum: 186

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	403	1288	-	-	-	-	-	-	-	-	-	-	-	1691	412.4	243.91
30-31	-	5776	-	-	-	-	-	-	-	-	-	-	-	5776	1498.5	259.46
31-32	-	9672	-	-	-	-	-	-	-	-	-	-	-	9672	2706.9	279.87
32-33	258	6065	73	-	-	-	-	-	-	-	-	-	-	6395	1921.2	300.42
33-34	-	-	4802	4833	-	-	-	-	-	-	-	-	-	9635	3249.9	337.29
34-35	-	-	9595	4214	2060	-	-	-	-	-	-	-	-	15869	5639.5	355.37
35-36	-	-	2272	9724	5853	9538	146	-	-	-	-	-	-	27532	10638.0	386.38
36-37	-	-	-	5828	16149	13429	3629	-	-	-	-	-	-	39036	16177.9	414.44
37-38	-	-	-	-	12897	6058	2547	-	-	-	-	-	-	21503	9362.5	435.41
38-39	-	-	-	-	-	7820	403	440	-	-	-	-	-	8663	3942.4	455.09
39-40	-	-	-	-	-	1698	-	36	-	-	-	-	-	1735	908.4	523.71
40-41	-	-	-	-	-	-	849	1698	661	-	-	-	-	3208	1769.9	551.74
41-42	-	-	-	-	-	-	-	1289	-	849	849	-	-	2987	1792.6	600.18
42-43	-	-	-	-	-	-	-	-	849	-	-	-	-	849	568.8	670.00
43-44	-	-	-	-	-	-	-	-	-	-	-	36	36	73	51.1	700.50
TSN(1000)	661	22800	16742	24600	36959	38544	7574	3463	1510	849	849	36	36	154623	-	-
TSB(1000 kg)	172.9	6344.2	5942.1	9278.0	15277.6	16407.3	3282.7	1935.9	915.7	529.8	502.6	26.2	25.0	-	60640.0	-
Mean length (cm)	30.17	30.90	33.84	34.67	36.08	36.45	36.87	40.11	41.12	41.00	41.00	43.00	43.00	-	-	-
Mean weight (g)	261.71	278.26	354.93	377.16	413.36	425.68	433.41	559.04	606.55	624.00	592.00	717.00	684.00	-	-	392.18

Variable: Abundance

EstLayer: 1

Stratum: 187

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	619	-	-	-	-	-	-	-	-	619	154.2	249.00
29-30	-	1857	-	-	-	-	-	-	-	1857	421.0	226.67
30-31	-	12382	-	-	-	-	-	-	-	12382	3278.8	264.80
31-32	3715	9906	-	-	-	-	-	-	-	13621	3954.3	290.32

32-33	-	3715	2476	-	-	-	-	-	-	6191	1893.9	305.90
33-34	-	1239	619	1266	619	-	-	-	-	3743	1194.3	319.05
34-35	-	-	5743	-	-	-	-	-	-	5743	2019.9	351.69
35-36	-	-	-	3947	2083	2028	-	-	-	8058	3048.3	378.32
36-37	-	-	-	-	-	3667	-	-	-	3667	1524.7	415.82
37-38	-	-	-	2680	-	759	-	-	-	3438	1469.3	427.36
38-39	-	-	-	-	-	-	1267	1914	-	3181	1469.8	462.01
39-40	-	-	-	-	-	-	-	648	-	648	328.8	507.60
41-42	-	-	-	-	-	-	-	-	619	619	370.2	598.00
TSN(1000)	4334	29099	8839	7892	2702	6453	1267	2562	619	63768	-	-
TSB(1000 kg)	1239.5	8087.7	2991.4	3067.1	987.0	2586.1	598.9	1199.6	370.2	-	21127.5	-
Mean length (cm)	30.57	30.66	33.37	35.36	34.54	35.80	38.00	38.25	41.00	-	-	-
Mean weight (g)	286.00	277.94	338.42	388.61	365.31	400.74	472.70	468.24	598.00	-	-	331.32

Variable: Abundance

EstLayer: 1

Stratum: 188

SpecCat: MAKRELL

	age									
LenGrp	4	5	6	7	8	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	52	-	-	-	-	-	-	52	17.5	337.00
35-36	-	-	-	311	-	-	-	311	119.4	383.67
36-37	104	104	52	571	-	-	-	830	330.5	398.13
37-38	-	156	259	571	52	-	-	1038	448.8	432.50
38-39	-	-	-	-	415	-	-	415	192.7	464.37
39-40	-	-	-	259	-	-	-	259	131.4	506.60
40-41	-	-	-	-	-	104	-	104	55.4	533.50
41-42	-	-	-	-	-	-	104	104	63.9	616.00
TSN(1000)	156	259	311	1712	467	104	104	3113	-	-
TSB(1000 kg)	63.2	105.7	131.5	723.9	216.0	55.4	63.9	-	1359.6	-
Mean length (cm)	35.33	36.60	36.83	36.61	37.89	40.00	41.00	-	-	-
Mean weight (g)	406.33	407.60	422.50	422.79	462.56	533.50	616.00	-	-	436.77

Variable: Abundance

EstLayer: 1

Stratum: 204

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	12	14	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	402	1433	1634	-	-	-	-	-	-	-	-	-	3469	1236.7	356.49
35-36	-	7167	3670	11037	3268	-	-	-	-	-	-	-	25142	9773.7	388.74
36-37	2867	1634	8572	10005	11813	7769	402	-	-	-	-	-	43062	17626.8	409.34
37-38	-	-	4300	8572	19409	7367	3067	-	201	-	-	-	42916	19156.0	446.36
38-39	-	-	-	4300	9403	6135	4300	-	-	-	-	-	24138	11348.1	470.14
39-40	-	-	-	1433	4902	4272	1433	201	-	201	-	-	12443	6319.1	507.85
40-41	-	-	-	1433	-	201	2036	4300	201	201	-	-	8371	4451.7	531.77
41-42	-	-	-	-	201	201	201	-	-	-	1433	-	2036	1217.9	598.26
42-43	-	-	-	-	-	-	-	-	201	-	-	-	201	115.1	573.00
43-44	-	-	-	-	-	-	-	-	-	-	-	1433	1433	1057.8	738.00
45-46	-	-	-	-	-	-	-	-	-	-	-	201	201	142.8	711.00
TSN(1000)	3268	10234	18176	36782	48996	25945	11439	4501	602	402	1433	1634	163412	-	-
TSB(1000 kg)	1380.4	3988.0	7407.3	15837.1	21715.3	11777.7	5308.4	2421.0	324.7	210.8	874.3	1200.6	-	72445.6	-
Mean length (cm)	35.75	35.02	35.85	36.44	37.03	37.32	38.20	39.96	39.67	39.50	41.00	43.25	-	-	-
Mean weight (g)	422.36	389.68	407.53	430.57	443.21	453.95	464.07	537.90	539.00	525.00	610.00	734.68	-	-	443.33

Variable: Abundance

EstLayer: 1

Stratum: 205

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	613	-	-	-	-	-	-	-	613	188.8	308.00
33-34	613	613	-	613	-	-	-	-	1839	699.9	380.67
34-35	-	-	2451	613	613	-	-	-	3677	1389.3	377.83
35-36	613	613	6805	3677	3064	613	-	-	15385	6216.2	404.05
36-37	-	-	1839	3804	4966	1839	740	-	13187	5746.1	435.73
37-38	-	-	1839	4290	9320	4903	-	-	20351	9111.0	447.69
38-39	-	-	-	-	3677	1416	-	64	5157	2546.1	493.73
39-40	-	-	-	-	-	1289	127	-	1416	815.7	575.95
40-41	-	-	-	-	-	613	-	-	613	330.9	540.00
41-42	-	-	-	-	64	-	-	-	64	33.5	527.00

TSN(1000)	|	1839	1226	12933	12997	21704	10672	867	64	62301	-	-
TSB(1000 kg)	|	639.2	524.6	5287.8	5405.5	9718.8	5080.8	391.5	29.4	-	27077.6	-
Mean length (cm)	|	33.33	34.00	35.24	35.81	36.59	37.26	36.44	38.00	-	-	-
Mean weight (g)	|	347.67	428.00	408.85	415.91	447.79	476.07	451.53	463.00	-	-	434.62

IESSNS 2014. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 39

SpecCat: MAKRELL

	age											
LenGrp		3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	|	-	601	-	-	-	-	-	-	601	203.4	338.27
33-34	|	457	-	-	-	-	-	-	-	457	148.1	323.80
34-35	|	-	5429	-	2287	2934	-	-	-	10650	4317.8	405.41
35-36	|	863	-	11467	12113	-	-	-	-	24443	10290.3	421.00
36-37	|	-	863	20909	11656	10375	1150	-	-	44953	21008.6	467.35
37-38	|	-	-	12142	31331	9841	288	9259	-	62860	31492.3	500.99
38-39	|	-	-	1007	22250	7486	15236	6095	-	52073	27663.1	531.24
39-40	|	-	-	10877	7630	3214	2745	-	-	24466	13562.9	554.35
40-41	|	-	-	-	-	8975	-	-	7736	16710	10713.0	641.10
41-42	|	-	-	-	-	3312	4684	-	889	8885	5713.8	643.12
42-43	|	-	-	-	-	-	3410	-	-	3410	2566.6	752.61
43-44	|	-	-	-	-	-	-	4703	-	4703	3518.8	748.20
44-45	|	-	-	-	-	1104	-	-	-	1104	1003.7	909.30
TSN(1000)	|	1320	6893	56402	87267	47240	27513	20057	8625	255316	-	-
TSB(1000 kg)	|	516.5	2836.4	27509.5	43135.8	25168.6	15900.9	11379.5	5755.5	-	132202.6	-
Mean length (cm)	|	34.31	34.08	36.63	36.94	37.90	39.01	38.71	40.10	-	-	-
Mean weight (g)	|	391.21	411.47	487.74	494.30	532.78	577.94	567.37	667.34	-	-	517.80

Variable: Abundance

EstLayer: 1

Stratum: 40

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	-	-	212	-	-	-	-	212	67.9	320.00
33-34	46	670	-	-	-	-	-	-	716	223.2	311.79
34-35	-	2647	-	-	-	-	-	-	2647	916.3	346.16
35-36	-	3563	4766	-	773	-	-	-	9102	3691.1	405.52
36-37	-	2510	6874	10088	15593	752	-	-	35818	16336.8	456.11
37-38	-	752	11806	16085	4379	4266	-	-	37288	17614.7	472.39
38-39	-	636	4783	3455	25065	3071	1503	-	38514	18879.3	490.19
39-40	-	-	183	3606	11865	-	1503	-	17157	9591.0	559.02
40-41	-	-	-	2993	3933	258	-	-	7184	4317.0	600.94
41-42	-	-	-	-	258	1819	-	-	2077	1309.4	630.40
42-43	-	-	-	-	-	258	-	-	258	161.0	624.57
43-44	-	-	-	-	-	-	-	408	408	277.0	678.71
TSN(1000)	46	10779	28412	36440	61867	10423	3007	408	151381	-	-
TSB(1000 kg)	15.4	4464.3	13105.0	17637.2	30693.0	5466.9	1725.7	277.0	-	73384.5	-
Mean length (cm)	33.00	35.18	36.60	37.23	37.72	38.12	38.50	43.00	-	-	-
Mean weight (g)	337.30	414.19	461.26	484.01	496.11	524.49	573.96	678.71	-	-	484.77

Variable: Abundance

EstLayer: 1

Stratum: 58

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	730	-	-	-	-	-	-	-	-	730	197.2	270.00
32-33	730	2191	-	-	-	-	-	-	-	2921	884.1	302.69
33-34	-	2921	730	-	-	-	-	-	-	3651	1215.5	332.92
34-35	-	3651	-	2921	-	-	-	-	-	6572	2494.7	379.61
35-36	-	-	-	13798	-	-	-	-	-	13798	5634.1	408.33
36-37	-	-	21906	3651	2191	2617	-	-	-	30365	13704.9	451.34
37-38	-	-	9474	-	18290	2921	35	-	-	30720	14523.9	472.79
38-39	-	-	907	22323	-	-	70	-	-	23301	12133.7	520.74
39-40	-	2399	-	2399	2434	4884	2191	-	-	14307	8185.9	572.16
40-41	-	-	654	35	4381	2216	2216	1125	-	10628	6181.8	581.65
41-42	-	-	-	872	1679	907	35	-	70	3563	2181.0	612.11
42-43	-	-	-	-	471	1125	35	-	218	1850	1276.3	689.99

43-44	-	-	-	-	-	-	35	35	218	288	213.0	739.62
44-45	-	-	-	-	-	-	-	218	-	218	194.4	891.45
TSN(1000)	1460	11162	33672	46000	29446	14671	4616	1379	506	142911	-	-
TSB(1000 kg)	396.5	4408.8	15474.5	21909.5	14605.8	8209.1	2785.8	872.8	357.6	-	69020.5	-
Mean length (cm)	31.50	34.42	36.35	36.80	37.85	38.57	39.52	40.71	42.29	-	-	-
Mean weight (g)	271.50	394.99	459.57	476.30	496.02	559.55	603.47	633.17	706.48	-	-	482.96

Variable: Abundance

EstLayer: 1

Stratum: 59

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	-	3938	1216	-	-	-	-	-	5154	1501.0	291.23
32-33	-	12893	10016	-	-	-	-	-	22909	7173.0	313.11
33-34	11381	559	21549	-	-	-	-	-	33489	11215.7	334.91
34-35	-	18330	14432	18974	2280	-	-	-	54015	20902.6	386.98
35-36	-	13677	15957	27669	26555	349	-	-	84207	34266.2	406.93
36-37	-	-	12650	35376	31229	52006	7297	-	138557	64839.9	467.96
37-38	-	-	-	25779	7118	66999	10945	3648	114490	55495.8	484.72
38-39	-	-	-	8582	349	-	48796	70	57798	31732.9	549.03
39-40	-	-	-	-	-	22914	2718	-	25633	13139.6	512.61
40-41	-	-	-	-	-	10938	6138	-	17076	10287.1	602.43
41-42	-	-	-	-	-	1499	-	-	1499	1008.9	673.12
42-43	-	-	-	-	-	-	1210	-	1210	884.4	731.18
43-44	-	-	-	-	1216	-	-	-	1216	898.3	738.65
TSN(1000)	11381	49397	75819	116381	68746	154706	77103	3718	557251	-	-
TSB(1000 kg)	3933.5	18086.4	28753.0	53317.7	29609.5	76059.9	41695.5	1889.6	-	253345.2	-
Mean length (cm)	33.00	33.50	33.95	35.81	35.78	37.21	37.93	37.02	-	-	-
Mean weight (g)	345.62	366.15	379.23	458.13	430.71	491.64	540.78	508.22	-	-	454.63

Variable: Abundance

EstLayer: 1

Stratum: 60

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	172	172	277	-	-	172	-	-	-	-	-	792	248.6	313.97
32-33	1068	1479	-	-	-	-	-	-	-	-	-	2546	870.6	341.91
33-34	-	627	2203	-	418	-	-	-	-	-	-	3247	1168.3	359.78
34-35	553	-	-	2404	3257	1717	-	-	-	-	-	7931	3134.8	395.25
35-36	-	343	2623	4400	1030	3307	-	-	-	-	-	11703	4943.2	422.38
36-37	-	-	3300	3309	7911	2866	859	3042	-	-	-	21287	9616.8	451.77
37-38	-	-	1247	4910	6626	4389	1553	-	-	-	-	18726	8804.9	470.20
38-39	-	-	-	836	-	1075	694	6322	-	-	-	8927	4594.4	514.67
39-40	-	-	-	-	4326	-	-	-	-	-	-	4326	2112.0	488.19
40-41	-	-	-	-	-	-	-	-	2317	-	-	2317	1387.5	598.89
41-42	-	-	-	-	-	-	-	276	104	-	-	381	223.5	587.20
42-43	-	-	-	-	-	-	-	-	-	-	277	277	181.4	656.00
43-44	-	-	-	-	-	-	-	-	277	277	-	553	393.5	711.50
TSN(1000)	1793	2620	9649	15859	23568	13526	3105	9641	2698	277	277	83013	-	-
TSB(1000 kg)	645.0	915.2	4061.4	6953.1	10634.0	5985.7	1463.7	4992.7	1659.9	187.8	181.4	-	37679.7	-
Mean length (cm)	32.52	32.57	35.03	35.83	36.46	35.92	36.95	37.45	40.35	43.00	42.00	-	-	-
Mean weight (g)	359.79	349.23	420.90	438.42	451.20	442.53	471.35	517.89	615.29	679.05	656.00	-	-	453.90

Variable: Abundance

EstLayer: 1

Stratum: 65

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	-	502	-	502	-	-	-	-	-	1003	337.6	336.50
33-34	502	502	1505	-	-	502	-	-	-	-	3009	1077.4	358.00
34-35	-	-	-	5016	1505	-	-	-	-	-	6520	2395.0	367.31
35-36	-	-	-	-	6520	4012	-	-	-	-	10533	4330.0	411.10
36-37	-	-	-	-	4012	10031	-	-	-	-	14044	6104.0	434.64
37-38	-	-	-	-	-	3009	4514	3009	-	-	10533	5097.4	483.95
38-39	-	-	-	-	-	-	2508	1505	-	-	4012	1995.2	497.25
39-40	-	-	-	-	-	-	-	-	2508	-	2508	1292.0	515.20
40-41	-	-	-	-	-	-	-	-	598	96	694	372.7	537.40
41-42	-	-	-	-	-	-	502	-	502	-	1003	628.0	626.00

42-43	|	-	-	-	-	-	-	-	-	502	-	502	309.5	617.00
TSN(1000)	|	502	502	2006	5016	12539	17555	7523	4514	4108	96	54361	-	-
TSB(1000 kg)	|	175.5	177.1	732.3	1831.2	5077.3	7687.4	3790.8	2213.9	2204.4	48.7	-	23938.6	-
Mean length (cm)	|	33.00	33.00	32.75	34.00	35.08	35.86	37.60	37.33	39.76	40.00	-	-	-
Mean weight (g)	|	350.00	353.00	365.00	365.10	404.92	437.91	503.87	490.44	536.55	507.00	-	-	440.37

Variable: Abundance

EstLayer: 1

Stratum: 66

SpecCat: MAKRELL

LenGrp	age	1	2	3	4	5	6	7	8	9	10	13	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	|	130	-	-	-	-	-	-	-	-	-	-	-	130	21.8	168.00
29-30	|	-	130	-	-	-	-	-	-	-	-	-	-	130	31.9	246.00
30-31	|	-	-	2179	-	-	-	-	-	-	-	-	-	2179	584.5	268.25
31-32	|	-	-	4862	-	-	-	-	-	-	-	-	-	4862	1460.6	300.38
32-33	|	-	-	1703	1328	-	-	-	-	-	-	-	-	3031	966.3	318.79
33-34	|	-	-	-	1950	390	-	1140	-	-	-	-	-	3480	1211.4	348.15
34-35	|	-	-	-	3687	-	-	4689	1298	-	-	-	-	9674	3615.4	373.73
35-36	|	-	-	-	-	983	3770	2207	-	2164	-	-	-	9124	3760.6	412.16
36-37	|	-	-	-	-	2703	-	7796	4343	260	-	-	-	15102	6642.9	439.88
37-38	|	-	-	-	-	-	1475	3742	5118	3246	-	-	-	13581	6377.0	469.56
38-39	|	-	-	-	-	-	-	3195	3232	-	-	-	-	6427	3222.9	501.48
39-40	|	-	-	-	-	-	-	-	2455	-	-	-	-	2455	1285.2	523.58
40-41	|	-	-	-	-	-	-	-	-	-	-	1977	-	1977	1131.5	572.32
41-42	|	-	-	-	-	-	-	-	-	-	286	-	-	286	168.9	590.48
43-44	|	-	-	-	-	-	-	-	-	-	-	-	130	130	90.9	700.00
TSN(1000)	|	130	130	8745	6965	4076	5244	22769	16445	5670	286	1977	130	72567	-	-
TSB(1000 kg)	|	21.8	31.9	2568.1	2433.6	1665.3	2208.2	9969.5	7725.4	2556.7	168.9	1131.5	90.9	-	30571.9	-
Mean length (cm)	|	27.00	29.00	30.95	33.34	35.47	35.56	35.79	36.99	36.19	41.00	40.00	43.00	-	-	-
Mean weight (g)	|	168.00	246.00	293.67	349.43	408.55	421.08	437.85	469.77	450.92	590.48	572.32	700.00	-	-	421.29

Variable: Abundance

EstLayer: 1

Stratum: 67

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	-	40	-	-	-	-	-	-	-	-	-	-	40	9.4	237.00
29-30	79	-	-	-	-	-	-	-	-	-	-	-	79	18.9	237.50
30-31	357	2261	-	-	-	-	-	-	-	-	-	-	2619	670.6	256.06
31-32	-	2388	1579	79	-	-	-	-	-	-	-	-	4046	1155.4	285.56
32-33	-	-	2673	2594	-	-	-	-	-	-	-	-	5267	1608.4	305.35
33-34	-	357	-	5838	-	-	159	-	-	-	-	-	6355	2149.8	338.30
34-35	-	-	-	2919	409	-	-	-	-	-	-	-	3328	1192.4	358.32
35-36	-	-	-	-	6035	238	-	-	-	-	-	-	6274	2481.7	395.58
36-37	-	-	-	818	-	4538	1729	119	-	1824	-	-	9028	3837.2	425.05
37-38	-	-	-	-	-	1587	3957	-	-	-	-	-	5544	2579.3	465.27
38-39	-	-	-	-	3041	-	-	-	-	-	-	-	3041	1494.3	491.47
39-40	-	-	-	-	-	363	91	182	182	-	-	-	818	441.8	540.33
40-41	-	-	-	-	-	-	-	-	-	-	-	1313	1313	708.1	539.30
41-42	-	-	-	-	-	-	-	-	182	-	182	-	363	207.3	570.50
42-43	-	-	-	-	-	91	91	91	-	-	-	-	273	164.3	603.00
TSN(1000)	437	5046	4252	12248	9484	6817	6026	392	363	1824	182	1313	48386	-	-
TSB(1000 kg)	110.0	1392.4	1275.2	4160.5	4036.0	2973.1	2791.4	207.4	204.8	755.7	104.2	708.1	-	18718.9	-
Mean length (cm)	29.82	30.67	31.63	33.21	35.92	36.44	36.71	38.78	40.00	36.00	41.00	40.00	-	-	-
Mean weight (g)	251.82	275.91	299.91	339.68	425.53	436.13	463.21	529.64	563.75	414.20	573.50	539.30	-	-	386.87

Variable: Abundance

EstLayer: 1

Stratum: 68

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	900	1092	-	-	-	-	-	-	1992	398.6	200.13
29-30	-	3729	-	-	-	-	-	-	3729	848.2	227.48
30-31	-	27889	-	-	-	-	-	-	27889	6925.8	248.33
31-32	1300	22480	-	-	-	-	-	-	23781	6489.0	272.87
32-33	-	910	19157	-	-	-	-	-	20068	6096.6	303.80
33-34	-	-	8746	1821	-	-	260	-	10827	3539.9	326.95
34-35	-	-	9895	780	1821	-	-	1155	13651	5026.4	368.21

35-36	-	2699	1929	1929	322	520	-	-	7400	3027.2	409.09
36-37	-	-	-	-	577	5658	905	-	7140	3030.2	424.40
37-38	-	-	-	-	-	5731	-	-	5731	2602.3	454.10
38-39	-	-	-	-	-	-	900	-	900	474.1	527.00
40-41	-	-	-	-	-	-	-	900	900	490.3	545.00
TSN(1000)	2200	58799	39728	4530	2720	11908	2065	2054	124005	-	-
TSB(1000 kg)	565.5	15489.7	13033.0	1698.7	1083.4	5208.3	952.5	917.1	-	38948.4	-
Mean length (cm)	29.77	30.54	32.86	34.02	34.54	36.44	36.49	36.63	-	-	-
Mean weight (g)	257.06	263.43	328.06	375.00	398.26	437.37	461.35	446.45	-	-	314.09

Variable: Abundance

EstLayer: 1

Stratum: 69

SpecCat: MAKRELL

	age														
LenGrp	1	2	3	4	5	6	7	8	9	10	11	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
25-26	-	-	-	-	-	-	-	-	-	-	-	983	983	128.8	131.00
26-27	-	-	-	-	-	-	-	-	-	-	-	983	983	143.6	146.00
27-28	2950	-	-	-	-	-	-	-	-	-	-	-	2950	515.2	174.67
28-29	-	12539	-	-	-	-	-	-	-	-	-	-	12539	2499.7	199.35
29-30	-	13899	14956	-	-	-	-	-	-	-	-	-	28855	6298.8	218.29
30-31	-	-	43172	-	15508	-	-	-	-	-	-	-	58680	13940.8	237.57
31-32	-	4932	39076	9694	11633	-	-	-	-	-	-	-	65336	17390.0	266.16
32-33	-	-	26267	32851	-	-	-	-	-	9696	-	-	68814	20132.4	292.56
33-34	-	-	1375	17953	3368	35271	3302	-	-	-	-	-	61269	19886.9	324.58
34-35	-	-	275	7781	7837	15796	2447	-	-	-	-	-	34136	11428.2	334.78
35-36	-	-	-	1545	5534	6949	13373	31314	-	-	-	-	58715	22490.4	383.04
36-37	-	-	-	-	-	28712	11648	3540	1650	-	-	-	45549	18326.9	402.35
37-38	-	-	-	2037	-	14582	-	3849	10161	-	-	-	30629	13189.7	430.63
38-39	-	-	-	-	-	-	2537	5734	-	3263	2172	-	13707	6362.8	464.21
39-40	-	-	-	-	-	-	-	-	3663	-	2634	-	6298	2918.0	463.36
40-41	-	-	-	-	-	-	-	1342	537	1999	-	-	3878	1935.5	499.14
41-42	-	-	-	-	-	-	268	268	268	1732	-	-	2537	1339.5	527.94
42-43	-	-	-	-	-	-	-	-	271	271	-	-	543	291.6	537.50
TSN(1000)	2950	31370	125120	71863	43881	101310	33575	46048	16550	16961	4806	1967	496401	-	-
TSB(1000 kg)	515.2	6850.4	31456.7	21410.7	12659.0	38692.8	12160.1	19410.3	6942.2	6647.9	2201.1	272.4	-	159218.7	-
Mean length (cm)	27.00	28.93	30.67	32.58	31.85	34.73	35.39	35.80	37.63	35.22	38.62	25.50	-	-	-
Mean weight (g)	174.67	218.37	251.41	297.94	288.49	381.92	362.18	421.52	419.46	391.94	457.95	138.50	-	-	320.75

Variable: Abundance

EstLayer: 1

Stratum: 77

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	11	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	20	-	-	-	-	-	-	-	-	20	8.7	433.75
35-36	27	-	-	-	20	-	-	-	-	47	19.2	406.90
36-37	-	27	47	-	-	-	-	-	-	74	36.1	485.87
37-38	-	129	67	87	54	-	-	-	-	338	169.8	502.97
38-39	-	74	60	-	-	-	20	-	-	155	78.7	508.94
39-40	-	27	27	74	109	20	20	-	-	277	155.4	559.95
40-41	-	-	-	27	74	-	-	-	-	102	62.5	615.98
41-42	-	-	20	20	-	183	-	-	-	223	137.0	614.12
42-43	-	-	-	-	-	27	54	20	-	102	67.2	661.83
43-44	-	-	-	-	-	-	-	-	27	27	18.4	677.75
44-45	-	-	-	-	-	-	-	27	-	27	21.7	799.75
TSN(1000)	47	257	222	209	257	230	94	47	27	1392	-	-
TSB(1000 kg)	19.7	130.2	117.1	115.5	140.1	142.3	56.4	35.3	18.4	-	774.9	-
Mean length (cm)	34.57	37.39	37.66	38.49	38.55	40.94	40.51	43.15	43.00	-	-	-
Mean weight (g)	416.42	505.79	527.44	552.63	544.24	618.30	596.99	746.33	677.75	-	-	556.66

Variable: Abundance

EstLayer: 1

Stratum: 78

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
7-8	-	-	-	-	-	-	-	-	46	46	-	-
30-31	-	796	-	-	-	-	-	-	-	796	203.0	255.00
31-32	-	3980	-	-	-	-	-	-	-	3980	1210.1	304.05
32-33	-	15755	-	-	-	-	-	-	-	15755	4863.6	308.70

33-34	168	1981	18608	332	-	-	-	-	-	21088	7573.4	359.13
34-35	-	10639	14141	10347	-	-	-	-	-	35128	13946.1	397.01
35-36	-	-	16054	22177	12231	12027	12333	-	-	74822	32310.9	431.84
36-37	-	1326	184	34691	20765	12393	12586	277	-	82221	37082.3	451.01
37-38	-	-	15703	11312	17330	10843	16893	1326	-	73408	35450.9	482.93
38-39	-	-	234	6232	7348	879	20395	-	-	35087	17599.7	501.59
39-40	-	-	-	-	-	15937	306	-	-	16243	8219.0	506.00
40-41	-	-	-	-	3846	-	214	75	-	4134	2424.9	586.52
41-42	-	-	-	663	-	-	230	1289	-	2182	1325.1	607.15
42-43	-	-	-	-	-	-	58	29	-	88	63.4	722.65
44-45	-	-	-	-	-	-	-	46	-	46	39.1	849.30
TSN(1000)	168	34478	64924	85754	61520	52079	63015	3042	46	365025	-	-
TSB(1000 kg)	61.3	11805.4	27135.3	38222.9	29098.6	24708.8	29615.2	1663.9	-	-	162311.4	-
Mean length (cm)	33.00	32.67	34.71	35.80	36.57	36.93	36.77	38.83	7.00	-	-	-
Mean weight (g)	366.00	342.41	417.95	445.73	472.99	474.45	469.97	546.91	-	-	-	444.71

Variable: Abundance

EstLayer: 1

Stratum: 79

SpecCat: MAKRELL

	age											
LenGrp	2	3	4	5	6	7	8	9	10	Number	Biomass	Mean W
										(1E3)	(1E3kg)	(g)
30-31	369	927	-	-	-	-	-	-	-	1296	378.5	292.01
31-32	187	-	8968	-	-	-	-	-	-	9155	2980.3	325.55
32-33	7259	12725	4858	-	-	-	-	-	-	24843	8130.4	327.27
33-34	862	12380	10968	8416	7821	-	-	-	-	40446	15093.4	373.17
34-35	261	-	8958	12287	5246	625	-	1723	-	29102	11088.1	381.01
35-36	-	196	7525	27162	8172	261	326	-	-	43641	17838.2	408.75
36-37	-	6658	1250	10283	9877	13693	4448	587	-	46796	21212.3	453.29
37-38	-	-	-	17058	11180	7263	1665	783	-	37949	17902.7	471.76
38-39	-	1250	-	-	8617	8150	587	4994	339	23938	12013.7	501.86
39-40	-	-	-	6858	-	-	718	3445	-	11020	5920.4	537.22
40-41	-	-	-	-	-	378	1971	555	378	3282	1771.7	539.81
41-42	-	-	-	-	-	3887	-	-	-	3887	2606.2	670.50
42-43	-	-	-	-	-	-	-	-	1422	1422	943.8	663.57
44-45	-	-	-	-	-	-	-	-	555	555	406.7	733.05
TSN(1000)	8938	34137	42527	82064	50913	34257	9715	12087	2694	277332	-	-
TSB(1000 kg)	2868.9	13016.3	15801.1	34760.3	22441.4	17121.9	4579.8	5972.4	1724.2	-	118286.4	-

Mean length (cm)	32.05	33.33	33.12	35.52	35.73	37.26	37.29	37.64	41.63	-	-	-
Mean weight (g)	320.98	381.30	371.56	423.58	440.78	499.81	471.40	494.11	639.92	-	-	426.52

Variable: Abundance

EstLayer: 1

Stratum: 80

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	855	3419	-	-	-	-	-	-	4274	1194.2	279.42
31-32	13455	-	-	-	-	-	-	-	13455	4167.2	309.71
32-33	-	41258	233	-	-	-	-	-	41491	13520.7	325.87
33-34	-	20343	16971	21913	-	-	-	-	59227	21348.8	360.45
34-35	3419	34368	31090	11112	-	855	-	-	80844	32605.7	403.31
35-36	-	-	26638	47829	35634	326	-	-	110427	45612.1	413.05
36-37	-	-	10397	40376	40516	30379	23448	-	145115	63048.5	434.47
37-38	-	855	6216	63265	4739	42754	279	-	118109	59049.9	499.96
38-39	-	-	-	-	994	40139	-	-	41134	20136.7	489.54
39-40	-	-	-	16835	-	-	-	-	16835	8843.5	525.30
40-41	-	-	-	-	-	-	-	6706	6706	4204.0	626.90
TSN(1000)	17729	100244	91545	201330	81883	114453	23727	6706	637617	-	-
TSB(1000 kg)	5627.0	35606.2	38235.1	89121.7	35638.1	54287.0	11012.1	4204.0	-	273731.1	-
Mean length (cm)	31.53	32.86	34.53	35.89	35.65	37.06	36.01	40.00	-	-	-
Mean weight (g)	317.39	355.20	417.66	442.66	435.23	474.32	464.11	626.90	-	-	429.30

Variable: Abundance

EstLayer: 1

Stratum: 81

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1122	2245	-	-	-	-	-	-	-	3367	941.4	279.55
31-32	-	13118	-	-	-	-	-	-	-	13118	3909.9	298.05

32-33	|	2269	7857	23380	-	-	-	-	-	-	33506	10646.0	317.73
33-34	|	6543	19082	17204	24	-	-	-	-	-	42853	14475.6	337.80
34-35	|	-	5612	29359	3367	-	-	-	-	-	38339	14266.7	372.12
35-36	|	-	-	-	14020	14053	8980	-	-	-	37053	15643.1	422.19
36-37	|	-	-	3739	19257	11967	5608	8980	-	-	49550	21863.1	441.23
37-38	|	-	-	10102	11216	4490	12744	-	-	-	38552	19128.3	496.17
38-39	|	-	-	-	5637	25053	-	-	-	-	30689	17543.1	571.64
39-40	|	-	-	-	-	-	9004	5608	-	-	14612	7718.2	528.21
40-41	|	-	-	-	-	-	-	-	1869	-	1869	1219.8	652.55
41-42	|	-	-	-	-	-	-	-	2057	-	2057	1415.5	688.10
42-43	|	-	-	-	-	-	1122	-	-	935	2057	1616.6	785.83
TSN(1000)	|	9934	47914	83783	53521	55562	37458	14588	3926	935	307622	-	-
TSB(1000 kg)	|	3133.7	15410.3	31352.9	23282.1	28560.7	18005.6	7210.4	2635.3	796.2	-	130387.2	-
Mean length (cm)	|	32.43	32.27	33.69	36.03	36.73	37.00	37.15	40.52	42.00	-	-	-
Mean weight (g)	|	315.45	321.62	374.21	435.01	514.03	480.69	494.28	671.18	851.80	-	-	423.85

Variable: Abundance

EstLayer: 1

Stratum: 82

SpecCat: MAKRELL

		age											
LenGrp		2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	|	143	-	-	-	-	-	-	-	-	143	34.2	239.60
29-30	|	1437	-	-	-	-	-	-	-	-	1437	405.8	282.49
30-31	|	11313	-	-	-	-	-	-	-	-	11313	3222.5	284.85
31-32	|	6223	10708	10661	-	-	-	-	-	-	27592	8166.8	295.98
32-33	|	8896	17600	18439	-	-	-	-	-	-	44936	13669.8	304.21
33-34	|	1116	9709	16143	8583	970	-	-	-	-	36521	12312.4	337.14
34-35	|	-	-	10956	6469	9075	-	-	-	-	26500	9677.5	365.19
35-36	|	-	714	11831	5399	3021	714	714	-	-	22393	9179.8	409.94
36-37	|	-	-	6232	9377	5675	2901	428	-	-	24614	10919.8	443.65
37-38	|	-	-	-	1044	12551	4577	-	714	-	18885	8897.2	471.11
38-39	|	-	-	-	-	3878	9100	-	-	-	12978	6379.2	491.54
39-40	|	-	-	2601	-	-	-	-	-	-	2601	1417.1	544.92
40-41	|	-	-	-	-	-	22	241	-	932	1196	678.6	567.50
41-42	|	-	-	-	-	-	-	857	-	-	857	607.2	708.90
TSN(1000)	|	29127	38732	76863	30872	35170	17314	2240	714	932	231963	-	-
TSB(1000 kg)	|	8509.9	12057.9	27283.9	12095.4	15362.7	8118.5	1239.9	365.7	533.9	-	85567.9	-

Mean length (cm)	30.88	32.03	33.38	34.61	35.89	37.28	38.02	37.00	40.00	-	-	-
Mean weight (g)	292.17	311.32	354.97	391.79	436.81	468.91	553.66	512.40	572.64	-	-	368.89

Variable: Abundance

EstLayer: 1

Stratum: 83

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	22	-	-	-	-	-	-	-	-	-	22	4.4	202.00
29-30	-	6991	-	-	-	-	-	-	-	-	6991	1779.7	254.57
30-31	-	34426	741	-	-	-	-	-	-	-	35167	9204.2	261.72
31-32	30289	30935	33010	-	-	-	-	-	-	-	94235	27077.7	287.34
32-33	1289	51854	74740	-	-	-	-	-	-	-	127882	40097.8	313.55
33-34	-	79980	1588	-	-	-	-	-	-	-	81568	28169.2	345.35
34-35	-	9565	1965	15941	797	-	-	-	-	-	28269	10219.5	361.51
35-36	-	-	28716	12911	485	1159	-	-	-	-	43271	16701.0	385.96
36-37	-	-	13275	32594	1026	284	371	-	-	-	47550	19906.2	418.64
37-38	-	-	463	19884	636	43	-	-	-	-	21026	9619.9	457.51
38-39	-	-	-	9929	-	-	4041	-	185	-	14156	7775.2	549.25
39-40	-	-	-	-	-	142	3352	142	-	-	3636	1788.8	491.90
40-41	-	-	-	-	-	93	93	6377	3188	-	9750	5294.4	543.00
42-43	-	-	-	-	-	-	-	-	-	3188	3188	1846.3	579.10
TSN(1000)	31600	213751	154499	91259	2944	1722	7857	6519	3374	3188	516713	-	-
TSB(1000 kg)	9175.7	66761.1	51000.8	39019.9	1248.6	788.6	4278.2	3558.9	1806.2	1846.3	-	179484.3	-
Mean length (cm)	31.04	31.90	32.73	35.94	35.51	35.81	38.36	39.98	39.89	42.00	-	-	-
Mean weight (g)	290.37	312.33	330.10	427.57	424.11	458.08	544.51	545.94	535.39	579.10	-	-	347.36

Variable: Abundance

EstLayer: 1

Stratum: 84

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)

27-28	36	-	-	-	-	-	-	-	-	-	-	-	36	6.3	172.00
30-31	-	2470	4348	-	-	-	-	-	-	-	-	-	6818	1741.2	255.38
31-32	-	495	13852	3627	-	-	-	-	-	-	-	-	17974	5225.7	290.74
32-33	-	-	3696	13523	317	-	-	-	-	-	-	-	17536	5564.1	317.30
33-34	-	165	4794	9536	3556	141	-	-	-	-	-	-	18192	6316.7	347.23
34-35	-	-	139	4479	6442	8182	247	-	-	-	-	-	19489	7618.9	390.93
35-36	-	-	-	1789	5254	2762	5014	-	-	-	-	-	14819	6181.7	417.14
36-37	-	-	208	2648	759	16893	131	350	-	-	-	-	20989	10072.0	479.88
37-38	-	-	-	330	5242	8645	5185	1098	-	-	-	-	20500	9583.9	467.51
38-39	-	-	-	412	-	2549	3331	766	141	141	-	-	7340	3699.0	503.93
39-40	-	-	-	25	108	221	632	730	249	1188	42	-	3195	1701.9	532.63
40-41	-	-	-	2541	21	25	105	25	132	339	25	462	3676	2216.7	603.01
41-42	-	-	-	-	-	-	69	-	-	721	-	56	847	524.6	619.35
42-43	-	-	-	-	-	82	146	-	-	42	-	-	270	179.1	662.79
43-44	-	-	-	-	-	508	-	82	-	-	-	-	590	433.6	734.62
44-45	-	-	-	-	-	-	-	-	-	-	56	-	56	44.5	799.75
TSN(1000)	36	3130	27036	38910	21700	40009	14860	3051	522	2432	123	518	152327	-	-
TSB(1000 kg)	6.3	845.3	8003.0	14557.8	8849.7	18557.8	6713.9	1486.0	274.9	1423.0	85.5	306.9	-	61109.9	-
Mean length (cm)	27.00	30.32	31.38	33.43	34.87	35.98	36.66	37.80	38.98	39.73	41.47	40.11	-	-	-
Mean weight (g)	172.00	270.08	296.01	374.14	407.82	463.84	451.81	486.99	526.43	585.17	695.80	592.10	-	-	401.18

Variable: Abundance

EstLayer: 1

Stratum: 85

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	328	-	-	-	-	-	-	-	-	-	-	-	328	78.0	238.00
29-30	-	3298	-	-	-	-	-	-	-	-	-	-	3298	839.2	254.47
30-31	-	2950	10700	-	-	-	-	-	-	-	-	-	13649	3885.1	284.63
31-32	2562	26008	16545	3989	-	-	-	-	-	-	-	-	49103	14881.5	303.07
32-33	14912	6514	14885	9941	-	-	-	-	-	-	-	-	46252	15126.3	327.04
33-34	16137	-	5150	11848	3276	-	-	-	-	-	-	-	36412	13534.0	371.69
34-35	-	774	26574	774	3529	4302	1685	-	-	-	-	-	37637	15422.3	409.76
35-36	-	-	13970	9760	-	3884	1929	-	-	-	-	-	29544	12818.7	433.89
36-37	-	-	6244	14581	3285	3416	4742	4582	-	-	-	-	36849	16923.4	459.26
37-38	-	-	-	11214	-	9474	2001	1925	-	4212	-	-	28826	14003.4	485.79
38-39	-	-	-	-	-	-	8643	888	1856	-	-	-	11387	5686.6	499.39

39-40	-	-	-	-	-	-	-	2927	322	-	-	1814	5063	2939.0	580.50
40-41	-	-	-	-	-	1889	-	-	-	-	-	-	1889	1045.3	553.35
41-42	-	-	-	-	-	194	-	-	-	-	116	-	309	170.8	552.14
42-43	-	-	-	-	-	-	328	-	-	-	-	-	328	193.0	589.00
TSN(1000)	33939	39543	94068	62107	10090	23159	19327	10322	2177	4212	116	1814	300874	-	-
TSB(1000 kg)	11614.8	11892.6	35364.9	25552.4	4079.7	10507.8	9102.7	5245.3	1112.2	2051.2	64.6	958.5	-	117546.7	-
Mean length (cm)	32.36	30.98	32.93	34.46	34.33	36.24	36.83	37.21	38.15	37.00	41.00	39.00	-	-	-
Mean weight (g)	342.23	300.75	375.95	411.42	404.33	453.72	470.98	508.18	510.76	487.00	559.00	528.33	-	-	390.68

Variable: Abundance

EstLayer: 1

Stratum: 86

SpecCat: MAKRELL

	age												
LenGrp	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	-	2766	-	-	-	-	-	-	-	-	-	2766	616.9	223.00
29-30	3272	14844	-	-	-	-	-	-	-	-	-	18116	4375.3	241.51
30-31	-	39874	-	-	-	-	-	-	-	-	-	39874	10324.2	258.92
31-32	-	42976	48673	6580	-	-	-	-	-	-	-	98229	27827.7	283.29
32-33	-	8334	31394	19364	2025	-	-	-	-	-	-	61117	18735.5	306.55
33-34	-	-	6580	13831	23139	-	-	-	-	-	-	43550	14501.9	332.99
34-35	-	-	4487	-	10432	3956	-	-	-	-	-	18875	6918.3	366.53
35-36	-	-	-	3375	-	2432	27510	-	-	-	-	33317	13537.3	406.32
36-37	-	-	-	-	907	6984	7557	6932	-	-	-	22381	9658.3	431.53
37-38	-	-	-	-	-	1518	11203	1887	2766	-	-	17375	7973.7	458.92
38-39	-	-	-	-	-	-	7529	2359	-	-	-	9888	4713.6	476.68
39-40	-	-	-	-	-	-	-	1815	-	-	-	1815	916.9	505.20
40-41	-	-	-	-	-	-	-	-	-	-	1452	1452	803.6	553.50
41-42	-	-	-	-	-	363	-	181	-	-	-	544	323.4	594.00
42-43	-	-	-	-	-	-	-	181	181	363	-	726	428.3	590.00
TSN(1000)	3272	108794	91134	43151	36503	15254	53799	13357	2948	363	1452	370027	-	-
TSB(1000 kg)	802.3	29196.3	27184.4	13712.0	12701.7	6356.7	23072.4	6219.9	1390.6	215.1	803.6	-	121654.9	-
Mean length (cm)	29.00	30.36	31.64	32.40	33.30	35.54	35.98	37.05	37.31	42.00	40.00	-	-	-
Mean weight (g)	245.15	268.36	298.29	317.77	347.96	416.73	428.86	465.68	471.74	592.50	553.50	-	-	328.77

Variable: Abundance

EstLayer: 1

Stratum: 87

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	1891	1891	-	-	-	-	-	-	-	-	3782	805.6	213.00
29-30	-	-	50780	-	-	-	-	-	-	-	50780	12264.0	241.51
30-31	-	58846	44281	-	-	-	-	-	-	-	103126	26849.7	260.36
31-32	-	86596	37455	27031	-	-	-	-	-	-	151083	42270.2	279.78
32-33	-	-	46636	45074	21740	-	-	-	-	-	113449	34727.8	306.11
33-34	-	22386	8325	10216	14343	574	-	-	-	-	55844	19422.6	347.80
34-35	-	-	-	990	4471	13516	-	-	-	-	18977	6987.8	368.22
35-36	-	-	-	-	10664	-	-	7986	-	-	18650	7497.2	401.99
36-37	-	-	-	-	1607	4225	-	12847	-	-	18679	7910.1	423.47
37-38	-	-	-	-	-	-	5814	-	-	918	6733	3017.8	448.23
38-39	-	-	-	-	-	-	-	3039	-	-	3039	1387.0	456.40
39-40	-	-	-	-	-	459	-	-	761	-	1220	593.0	486.08
40-41	-	-	-	-	-	-	-	-	2703	-	2703	1373.2	508.00
42-43	-	-	-	-	-	-	115	-	115	-	230	133.9	583.00
TSN(1000)	1891	169719	187477	83311	52825	18774	5929	23872	3579	918	548295	-	-
TSB(1000 kg)	412.3	48038.3	50865.8	25417.3	18261.9	7192.0	2676.1	10161.6	1805.5	409.1	-	165239.9	-
Mean length (cm)	28.00	30.88	30.56	31.82	33.17	34.54	37.10	35.92	39.85	37.00	-	-	-
Mean weight (g)	218.00	283.05	271.32	305.09	345.71	383.09	451.36	425.66	504.51	445.50	-	-	301.37

Variable: Abundance

EstLayer: 1

Stratum: 88

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	-	7267	-	-	-	-	-	-	-	-	7267	1632.9	224.71
29-30	25082	21272	-	-	-	-	-	-	-	-	46354	10993.2	237.16
30-31	6981	87055	-	-	-	-	-	-	-	-	94035	23963.5	254.84
31-32	-	48436	35612	-	-	4480	-	-	-	-	88528	24610.3	277.99
32-33	-	10138	37736	-	-	-	-	-	-	-	47875	14446.3	301.75

33-34	-	-	43875	988	2469	3889	-	-	-	-	51221	17475.1	341.17
34-35	7404	1530	13873	11077	-	-	-	11951	-	-	45835	16545.7	360.98
35-36	-	-	11084	22650	2342	3247	543	-	-	-	39865	15414.6	386.66
36-37	-	-	20413	3120	4523	811	7137	3456	-	-	39458	16092.5	407.84
37-38	-	-	-	450	6929	2641	2603	-	1482	-	14106	5823.5	412.84
38-39	-	-	-	-	270	674	8077	-	-	-	9021	3855.9	427.45
39-40	-	-	-	-	-	-	3715	2180	-	-	5895	3034.6	514.77
40-41	-	-	-	-	-	-	-	-	456	3183	3638	1863.6	512.20
41-42	-	-	-	-	-	-	91	-	-	-	91	46.2	510.00
42-43	-	-	-	-	-	-	91	-	-	-	91	54.8	604.00
TSN(1000)	39466	175698	162592	38285	16533	15741	22256	17587	1937	3183	493279	-	-
TSB(1000 kg)	10272.0	46168.0	53559.2	14570.6	6528.4	5392.6	9883.3	6953.1	884.1	1641.3	-	155852.6	-
Mean length (cm)	30.11	30.22	32.93	34.76	35.86	33.88	37.36	35.01	37.71	40.00	-	-	-
Mean weight (g)	260.27	262.77	329.41	380.58	394.86	342.58	444.07	395.37	456.34	515.69	-	-	315.95

Variable: Abundance

EstLayer: 1

Stratum: 89

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	100	-	-	-	-	-	-	-	-	-	-	-	100	18.8	188.00
28-29	-	1853	-	-	-	-	-	-	-	-	-	-	1853	377.4	203.71
29-30	-	2943	5058	-	-	-	-	-	-	-	-	-	8002	1766.6	220.78
30-31	-	671	7721	-	-	-	-	-	-	-	-	-	8392	2078.4	247.67
31-32	-	-	5938	1417	-	-	-	-	-	-	-	-	7355	1961.4	266.68
32-33	-	400	500	2748	2034	-	-	-	-	-	-	-	5682	1642.7	289.12
33-34	-	-	-	591	1370	-	-	-	-	-	-	-	1961	651.7	332.35
34-35	-	-	-	-	142	671	-	-	-	-	-	-	813	263.3	323.79
35-36	-	-	-	1092	-	420	-	-	-	-	-	-	1512	585.2	386.91
36-37	-	-	-	392	1488	1785	214	-	-	-	-	-	3879	1635.6	421.69
37-38	-	-	-	-	401	664	2643	1338	161	-	-	-	5207	2254.2	432.95
38-39	-	-	-	-	-	1137	937	-	420	465	-	-	2958	1386.2	468.60
39-40	-	-	-	-	-	186	-	186	307	583	36	-	1297	644.4	496.65
40-41	-	-	-	-	-	107	1156	36	143	-	279	-	1720	871.0	506.42
41-42	-	-	-	-	-	-	-	-	107	-	465	-	572	325.4	568.82
42-43	-	-	-	-	-	200	-	-	-	-	-	384	584	372.8	638.01
43-44	-	-	-	-	-	-	-	-	-	-	129	-	129	87.9	682.40
45-46	-	-	-	-	-	-	-	-	-	36	-	-	36	27.3	756.00

TSN(1000)	100	5867	19217	6240	5435	5169	4948	1560	1138	1084	909	384	52051	-	-
TSB(1000 kg)	18.8	1326.2	4746.9	1963.3	1887.4	2218.9	2247.9	679.0	566.1	528.8	515.2	251.8	-	16950.2	-
Mean length (cm)	27.00	29.00	30.10	32.64	33.77	36.65	37.85	37.31	38.66	38.77	40.90	42.00	-	-	-
Mean weight (g)	188.00	226.04	247.01	314.66	347.24	429.23	454.26	435.33	497.56	488.04	566.76	655.05	-	-	325.64

Variable: Abundance

EstLayer: 1

Stratum: 97

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	-	50	-	-	-	-	-	-	-	50	14.2	283.35
31-32	49777	300	3517	-	-	-	-	-	-	53593	16938.8	316.06
32-33	6648	92465	36757	-	-	-	-	-	-	135870	46271.2	340.56
33-34	45218	88691	51774	-	-	-	-	-	-	185683	65630.1	353.45
34-35	10551	106859	12431	4418	3767	-	-	-	-	138025	50942.9	369.09
35-36	450	62759	15832	35847	-	5275	-	-	-	120163	50692.6	421.87
36-37	-	250	300	64407	6472	3804	7034	-	-	82266	38697.1	470.39
37-38	1974	150	46744	4448	8864	27164	1974	-	-	91317	44072.8	482.63
38-39	-	-	-	-	47825	4290	-	-	-	52115	27742.2	532.33
39-40	-	-	-	6551	9053	-	-	-	-	15605	8339.3	534.42
40-41	-	4527	-	-	-	5021	879	494	4527	15448	8585.8	555.79
41-42	-	-	-	-	987	-	-	-	-	987	651.7	660.25
42-43	-	-	-	-	-	-	-	494	-	494	420.4	851.80
43-44	-	-	-	-	-	-	879	-	-	879	667.1	758.75
TSN(1000)	114617	356050	167354	115671	76968	45554	10766	987	4527	892495	-	-
TSB(1000 kg)	38739.0	131688.0	67178.8	52375.3	39760.8	21640.6	5234.6	690.4	2358.7	-	359666.3	-
Mean length (cm)	32.24	33.48	34.12	35.82	37.68	37.11	37.08	41.00	40.00	-	-	-
Mean weight (g)	337.99	369.86	401.42	452.80	516.59	475.05	486.20	699.40	521.00	-	-	402.99

Variable: Abundance

EstLayer: 1

Stratum: 99

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	141	-	-	-	-	-	-	-	-	141	38.0	269.12
31-32	715	-	-	-	-	-	-	-	-	715	215.4	301.26
32-33	1091	610	-	-	-	-	-	-	-	1701	556.7	327.25
33-34	98	965	147	-	-	-	-	-	-	1211	405.3	334.72
34-35	184	393	1145	925	-	-	-	-	-	2646	975.6	368.69
35-36	685	-	2397	972	243	-	-	-	-	4297	1715.8	399.32
36-37	-	782	1555	1603	553	184	-	-	-	4677	2056.3	439.61
37-38	-	-	748	1302	1546	728	230	-	-	4554	2115.8	464.58
38-39	-	1467	-	380	282	-	-	-	-	2130	1005.1	471.98
39-40	-	-	-	46	211	370	176	46	-	848	432.1	509.37
40-41	-	-	-	-	-	49	92	-	-	141	75.2	532.85
42-43	-	-	-	-	-	81	-	-	95	176	112.4	638.85
TSN(1000)	2914	4218	5993	5227	2835	1411	498	46	95	23238	-	-
TSB(1000 kg)	1004.0	1650.3	2484.7	2237.4	1286.7	699.1	258.8	27.0	55.8	-	9703.7	-
Mean length (cm)	32.52	35.24	35.27	35.88	36.88	37.78	38.26	39.00	42.00	-	-	-
Mean weight (g)	344.58	391.29	414.57	428.01	453.80	495.31	519.86	587.00	586.45	-	-	417.58

Variable: Abundance

EstLayer: 1

Stratum: 100

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	1834	-	-	-	-	-	-	-	-	-	-	1834	419.9	229.00
30-31	20737	-	-	-	-	-	-	-	-	-	-	20737	5506.6	265.55
31-32	25451	14745	52665	-	-	-	-	-	-	-	-	92861	26430.4	284.62
32-33	15071	33294	87525	-	-	-	-	-	-	-	-	135891	41395.0	304.62
33-34	-	-	56837	37030	9568	-	-	-	-	-	-	103435	34608.5	334.59
34-35	-	24927	10872	47629	25537	-	-	5152	-	-	-	114118	42219.0	369.96
35-36	-	15290	3671	44359	28252	32414	1937	-	-	-	-	125921	50959.8	404.70
36-37	-	-	23296	2944	85653	39186	8683	-	-	-	-	159762	68691.6	429.96
37-38	-	-	13681	26338	8684	81023	22986	-	-	-	-	152712	71915.7	470.92
38-39	-	-	1401	19248	29642	19806	801	1472	-	-	-	72370	36101.5	498.85
39-40	-	-	1700	5597	-	22720	2653	-	5167	-	-	37836	20122.8	531.84
40-41	-	-	-	-	3016	2280	777	9451	1099	-	1834	18457	10160.8	550.51

41-42	-	-	-	-	-	-	-	-	1834	-	-	1834	1162.2	633.80
42-43	-	-	-	-	-	-	-	200	-	936	-	1136	697.5	613.81
TSN(1000)	63093	88257	251647	183145	190353	197429	37836	16275	8100	936	1834	1038904	-	-
TSB(1000 kg)	17615.6	30231.9	83503.4	73563.7	80813.0	93130.5	17394.7	8068.2	4198.7	588.6	1282.6	-	410391.1	-
Mean length (cm)	30.82	32.92	32.87	35.08	35.85	36.84	36.89	37.94	39.59	42.00	40.00	-	-	-
Mean weight (g)	279.20	342.54	331.83	401.67	424.54	471.72	459.74	495.73	518.37	628.73	699.50	-	-	395.02

Variable: Abundance

EstLayer: 1

Stratum: 104

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	-	-	350	-	-	-	-	-	-	-	-	-	350	77.7	222.00
30-31	279	-	1256	1050	-	-	-	-	-	-	-	-	2585	672.4	260.14
31-32	-	-	5242	979	-	-	-	-	-	-	-	-	6221	1715.6	275.76
32-33	-	1386	-	8842	1926	-	-	-	-	-	-	-	12154	3773.0	310.42
33-34	-	-	3641	8035	1888	413	-	-	-	-	-	-	13976	4701.4	336.40
34-35	-	2101	2150	11072	688	3065	112	-	90	-	-	-	19278	6920.1	358.97
35-36	-	2501	-	5863	13409	7113	3315	-	-	-	-	-	32200	13182.5	409.39
36-37	-	-	1393	18071	15056	4148	3249	18	22	-	-	-	41957	18128.9	432.08
37-38	-	-	-	35	1630	17773	9285	9350	180	-	-	-	38253	17388.2	454.55
38-39	-	-	-	1365	1751	4547	7053	736	18	-	-	-	15469	7558.3	488.62
39-40	-	-	-	-	-	-	3964	2687	2590	718	-	90	10049	5006.2	498.18
40-41	-	-	-	-	-	-	-	3226	-	-	-	-	3226	1795.3	556.54
41-42	-	-	-	-	-	-	-	-	1485	-	-	-	1485	841.0	566.40
42-43	-	-	-	-	-	-	-	-	-	950	-	-	950	557.8	587.05
43-44	-	-	-	-	-	555	-	-	-	-	138	-	693	502.0	724.71
TSN(1000)	279	5988	14032	55314	36347	37613	26978	16017	4385	1668	138	90	198847	-	-
TSB(1000 kg)	82.1	2235.2	4354.7	21036.5	14654.7	16794.2	12636.6	7699.2	2259.7	927.9	93.4	46.4	-	82820.7	-
Mean length (cm)	30.00	33.95	32.34	34.27	35.37	36.43	37.18	37.98	39.47	40.71	43.00	39.00	-	-	-
Mean weight (g)	294.65	373.27	310.35	380.31	403.19	446.50	468.41	480.70	515.37	556.24	679.05	516.43	-	-	416.50

Variable: Abundance

EstLayer: 1

Stratum: 105

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	-	1310	-	-	-	-	-	-	-	1310	331.4	253.00
30-31	1304	9507	-	-	-	-	-	-	-	10811	2757.2	255.05
31-32	8484	-	32564	-	-	-	-	-	-	41048	12080.5	294.30
32-33	-	29974	45808	-	-	-	-	-	-	75781	24433.5	322.42
33-34	-	16810	24420	22898	-	1912	-	-	-	66040	21967.6	332.64
34-35	-	10087	11768	13737	13584	21302	-	2579	-	73057	27465.4	375.94
35-36	-	-	-	10562	30629	21716	15253	3179	-	81338	34179.3	420.21
36-37	-	-	-	26727	4206	29407	-	6903	-	67243	29501.9	438.74
37-38	-	-	-	13403	16754	3154	10267	1906	3526	49011	22885.6	466.95
38-39	-	-	-	-	-	-	14924	5506	-	20429	10360.2	507.13
39-40	-	-	-	-	-	6640	-	-	-	6640	3366.0	506.91
40-41	-	-	-	-	-	4789	-	-	-	4789	2688.5	561.42
41-42	-	-	-	-	-	-	513	-	-	513	277.3	540.00
TSN(1000)	9788	67687	114559	87327	65172	88921	40957	20072	3526	498010	-	-
TSB(1000 kg)	2894.7	21933.6	36986.4	35480.2	27359.9	37852.1	18928.3	9128.2	1730.9	-	192294.4	-
Mean length (cm)	30.87	32.21	32.13	34.93	35.37	35.69	36.67	36.23	37.00	-	-	-
Mean weight (g)	295.74	324.04	322.86	406.29	419.81	425.68	462.15	454.76	490.86	-	-	386.13

Variable: Abundance

EstLayer: 1

Stratum: 106

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	11	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
26-27	-	-	-	-	-	-	-	-	-	-	1308	1308	214.4	164.00
27-28	1680	-	-	-	-	-	-	-	-	-	-	1680	352.8	210.00
28-29	-	-	10053	-	-	-	-	-	-	-	-	10053	2142.1	213.08
29-30	-	-	56463	-	-	-	-	-	-	-	-	56463	13469.9	238.56
30-31	-	26676	74276	23244	-	-	-	-	-	-	-	124196	32529.7	261.92
31-32	-	-	91303	66315	-	-	-	-	-	-	-	157618	45224.1	286.92
32-33	-	-	37965	34730	38704	-	-	-	-	-	-	111398	34564.2	310.28
33-34	-	-	-	-	57773	9545	-	-	-	-	-	67318	22679.6	336.90

34-35	-	-	-	2595	23875	13783	11897	-	-	-	-	52150	19292.1	369.93
35-36	-	-	-	-	-	24558	-	7604	-	-	-	32162	12370.8	384.65
36-37	-	-	-	-	-	19177	-	10244	-	-	-	29422	12613.6	428.72
37-38	-	-	-	-	-	-	-	-	6996	6517	-	13513	6084.9	450.29
38-39	-	-	-	-	-	-	-	3013	1407	-	-	4420	1812.2	409.99
40-41	-	-	-	-	-	-	-	1716	1397	-	-	3113	1629.6	523.55
41-42	-	-	-	-	-	-	-	1680	-	-	-	1680	902.2	537.00
TSN(1000)	1680	26676	270060	126883	120353	67063	11897	24257	9800	6517	1308	666493	-	-
TSB(1000 kg)	352.8	6840.6	72650.9	37140.5	40602.9	25962.9	4409.0	10172.9	4655.9	2879.4	214.4	-	205882.2	-
Mean length (cm)	27.00	30.00	30.34	31.15	32.88	34.80	34.00	36.56	37.57	37.00	26.00	-	-	-
Mean weight (g)	210.00	256.43	269.02	292.71	337.37	387.14	370.60	419.38	475.08	441.85	164.00	-	-	308.90

Variable: Abundance

EstLayer: 1

Stratum: 107

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	16247	-	-	-	-	-	-	-	-	-	16247	3575.1	220.05
29-30	1613	101738	-	-	-	-	-	-	-	-	103351	24324.0	235.35
30-31	-	137957	-	-	-	-	-	-	-	-	137957	34776.8	252.09
31-32	-	120381	29384	-	-	-	-	-	-	-	149765	40576.3	270.93
32-33	-	36090	52321	-	-	-	-	-	-	-	88411	25818.5	292.03
33-34	-	9468	24612	39894	-	1614	-	-	-	-	75587	23887.6	316.03
34-35	-	1078	-	15798	3478	808	-	4677	-	-	25839	9068.2	350.95
35-36	-	-	-	14140	23796	6893	-	-	-	-	44829	17159.6	382.78
36-37	-	-	-	-	12284	540	540	5497	-	-	18861	7723.2	409.48
37-38	-	-	-	1075	806	15880	6401	538	-	-	24700	10693.7	432.95
38-39	-	-	-	-	6898	-	-	-	539	1235	8673	4062.9	468.47
39-40	-	-	-	-	-	1235	3749	-	-	-	4984	2446.7	490.87
40-41	-	-	-	-	-	269	-	4443	-	-	4712	2877.8	610.72
TSN(1000)	17860	406711	106316	70907	47263	27239	10690	15154	539	1235	703915	-	-
TSB(1000 kg)	3967.9	105191.1	31156.2	23648.3	19144.0	11007.0	5004.2	7082.0	266.9	522.6	-	206990.3	-
Mean length (cm)	28.09	30.30	31.96	33.68	35.66	36.27	37.65	36.59	38.00	38.00	-	-	-
Mean weight (g)	222.17	258.64	293.05	333.51	405.06	404.08	468.13	467.33	495.00	423.00	-	-	294.06

Variable: Abundance

EstLayer: 1

Stratum: 108

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	2244	-	-	-	-	-	-	-	-	-	2244	493.0	219.66
28-29	-	-	2113	-	-	-	-	-	-	-	2113	481.1	227.71
29-30	-	5647	15598	-	-	-	-	-	-	-	21245	5245.7	246.91
30-31	-	8426	37456	-	-	-	-	-	-	-	45882	11801.1	257.20
31-32	-	34	7756	20859	-	-	-	-	-	-	28649	8135.7	283.98
32-33	-	-	2770	9059	-	-	-	-	-	-	11829	3511.1	296.83
33-34	-	-	-	6294	-	-	-	-	-	-	6294	2005.2	318.60
34-35	-	-	-	2986	2848	-	-	-	-	-	5834	2024.7	347.05
35-36	-	-	-	-	521	3701	7226	-	-	-	11448	4411.0	385.31
36-37	-	-	-	-	1839	6443	1943	-	-	-	10225	4138.2	404.72
37-38	-	-	-	-	-	1043	8779	-	2115	-	11937	5183.5	434.25
38-39	-	-	-	-	-	-	5465	-	-	-	5465	2609.2	477.43
39-40	-	-	-	-	-	-	-	132	132	132	397	184.6	465.33
40-41	-	-	-	-	-	-	-	-	132	-	132	65.4	495.00
41-42	-	-	-	-	-	-	-	-	397	-	397	199.2	502.33
42-43	-	-	-	-	-	-	-	-	-	132	132	73.2	554.00
TSN(1000)	2244	14108	65692	39198	5209	11187	23412	132	2776	264	164222	-	-
TSB(1000 kg)	493.0	3555.5	17138.5	11508.6	1915.8	4559.3	9894.1	66.6	1302.8	127.4	-	50561.8	-
Mean length (cm)	27.00	29.60	29.90	31.78	34.81	35.76	36.53	39.00	37.81	40.50	-	-	-
Mean weight (g)	219.66	252.03	260.89	293.60	367.79	407.57	422.61	504.00	469.33	482.00	-	-	307.89

Variable: Abundance

EstLayer: 1

Stratum: 109

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	1067	-	-	-	-	-	-	-	-	1067	214.9	201.47
28-29	-	-	11877	-	-	-	-	-	-	11877	2744.3	231.07

29-30	-	5412	40549	19331	-	-	-	-	-	65292	16224.7	248.49
30-31	-	1472	162612	23059	-	-	-	-	-	187142	49266.8	263.26
31-32	-	-	76836	7696	-	-	-	-	-	84532	24261.4	287.01
32-33	-	-	4712	31452	-	-	-	-	-	36164	11584.5	320.33
33-34	-	-	1464	8552	-	-	-	-	-	10015	3309.8	330.47
34-35	-	-	-	563	4842	-	5494	-	-	10899	4188.1	384.27
35-36	-	-	-	-	-	8591	4439	-	-	13030	5287.0	405.76
36-37	-	-	-	-	-	8034	7845	240	160	16279	6772.4	416.02
37-38	-	-	-	-	142	5010	2823	322	322	8618	4030.7	467.70
38-39	-	-	-	405	-	-	1238	243	162	2047	1002.6	489.67
39-40	-	-	-	-	-	-	498	890	-	1388	711.6	512.73
40-41	-	-	-	-	-	324	-	-	-	324	165.5	511.25
41-42	-	-	-	-	-	-	162	-	-	162	87.3	539.50
42-43	-	-	-	-	-	81	71	-	-	152	84.9	557.22
TSN(1000)	1067	6884	298049	91057	4984	22040	22570	1695	644	448988	-	-
TSB(1000 kg)	214.9	1733.5	80053.0	25991.7	1916.8	9522.5	9437.3	779.9	286.9	-	129936.5	-
Mean length (cm)	27.00	29.21	30.09	30.91	34.09	35.92	35.67	38.05	37.00	-	-	-
Mean weight (g)	201.47	251.82	268.59	285.44	384.62	432.06	418.14	460.17	445.89	-	-	289.40

Variable: Abundance

EstLayer: 1

Stratum: 118

SpecCat: MAKRELL

	age										
LenGrp	3	4	5	6	7	8	9	10	12	Number	Biomass	Mean W
										(1E3)	(1E3kg)	(g)
31-32	-	-	-	652	-	-	-	-	-	652	180.6	277.00
32-33	76	652	-	-	-	-	-	-	-	728	246.7	339.03
33-34	728	803	-	-	-	-	-	-	-	1531	515.7	336.86
34-35	-	2031	-	652	76	-	-	-	-	2759	979.4	354.97
35-36	2259	-	-	-	3487	-	-	-	-	5745	2360.4	410.86
36-37	-	2835	151	5745	3259	-	-	-	-	11991	5348.6	446.07
37-38	-	757	-	14342	6897	-	5867	-	-	27863	13211.3	474.15
38-39	-	303	3213	4639	10430	2608	-	-	-	21193	10564.0	498.47
39-40	-	-	5215	5367	-	-	76	-	-	10657	5955.6	558.83
40-41	-	-	-	7823	2031	-	-	-	-	9854	6212.6	630.46
41-42	-	-	-	5215	-	-	-	-	-	5215	3190.6	611.80
42-43	-	-	-	-	652	1379	652	-	652	3335	2086.4	625.58
43-44	-	-	-	-	-	-	-	728	-	728	526.7	723.86

TSN(1000)	3062	7381	8580	44434	26833	3987	6595	728	652	102251	-	-
TSB(1000 kg)	1170.7	2795.1	4695.7	23413.0	12856.0	2267.6	3277.6	526.7	376.1	-	51378.6	-
Mean length (cm)	34.45	34.95	38.57	38.08	37.35	39.38	37.52	43.00	42.00	-	-	-
Mean weight (g)	382.36	378.67	547.30	526.92	479.11	568.75	497.01	723.86	577.00	-	-	502.48

Variable: Abundance

EstLayer: 1

Stratum: 121

SpecCat: MAKRELL

	age								
LenGrp	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
35-36	-	58	58	-	29	-	144	57.3	398.47
36-37	58	58	115	29	-	-	259	113.4	437.82
37-38	-	29	86	-	-	-	115	51.9	450.80
38-39	58	-	-	-	-	-	58	29.1	506.33
39-40	-	-	29	86	29	-	144	75.8	526.50
40-41	-	-	-	-	86	29	115	65.0	564.34
41-42	-	-	-	29	58	29	115	71.6	621.84
42-43	-	-	29	-	-	-	29	20.4	709.10
TSN(1000)	115	144	317	144	201	58	979	-	-
TSB(1000 kg)	54.9	59.1	147.6	77.9	110.5	34.6	-	484.6	-
Mean length (cm)	37.00	35.80	36.91	38.80	39.43	40.50	-	-	-
Mean weight (g)	476.59	410.83	466.31	541.19	548.19	600.85	-	-	495.14

Variable: Abundance

EstLayer: 1

Stratum: 122

SpecCat: MAKRELL

	age										
LenGrp	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	360	-	-	-	-	-	-	-	360	117.8	327.40
33-34	253	42	168	42	-	-	-	-	505	173.3	343.08
34-35	-	-	1010	-	-	-	-	-	1010	426.3	422.05

35-36	|	907	589	949	-	-	-	-	-	2445	976.4	399.30
36-37	|	696	2146	130	934	-	-	-	-	3907	1817.8	465.20
37-38	|	-	2609	2323	2127	1431	-	-	-	8491	4097.0	482.53
38-39	|	-	1347	46	3115	1121	528	46	-	6203	3159.2	509.28
39-40	|	-	-	720	720	1263	1799	-	1244	5744	3164.4	550.88
40-41	|	-	-	-	-	-	-	2622	-	2622	1414.5	539.55
41-42	|	-	-	-	547	-	158	-	-	705	425.4	603.58
42-43	|	-	-	-	-	-	-	276	-	276	195.6	709.74
43-44	|	-	-	-	-	-	-	-	191	191	139.9	730.60
44-45	|	-	-	-	-	-	191	-	-	191	153.0	799.35
TSN(1000)	|	2216	6734	5347	7485	3815	2676	2943	1435	32651	-	-
TSB(1000 kg)	|	875.7	3167.3	2443.8	3834.8	1991.1	1539.1	1636.1	772.5	-	16260.4	-
Mean length (cm)	|	34.60	36.68	36.21	37.75	37.96	39.28	40.16	39.53	-	-	-
Mean weight (g)	|	395.21	470.36	457.07	512.34	521.92	575.15	555.83	538.30	-	-	498.01

Variable: Abundance

EstLayer: 1

Stratum: 123

SpecCat: MAKRELL

		age										
LenGrp		3	4	5	6	7	8	9	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	|	774	-	-	-	-	-	-	-	774	207.5	268.15
31-32	|	13633	-	-	-	-	-	-	-	13633	4059.2	297.75
32-33	|	3970	3943	-	-	-	-	-	-	7913	2476.1	312.90
33-34	|	74	7739	46455	-	-	-	-	-	54267	18427.9	339.58
34-35	|	-	334	12859	1003	47945	-	-	-	62142	24281.7	390.74
35-36	|	589	54245	20783	38356	7693	-	-	-	121666	50656.1	416.35
36-37	|	-	22374	17233	38239	33004	25868	2823	-	139541	62236.9	446.01
37-38	|	6834	19944	26490	50100	13541	24724	-	-	141634	67465.2	476.34
38-39	|	-	4744	-	18892	20394	12279	6689	-	62998	32595.8	517.41
39-40	|	-	-	11261	-	8788	11284	5758	-	37092	20831.9	561.63
40-41	|	-	-	-	-	-	2625	1777	-	4402	2564.9	582.66
41-42	|	-	-	-	-	4974	-	-	1068	6042	3693.2	611.27
42-43	|	-	-	-	-	-	-	-	774	774	535.7	692.25
43-44	|	-	-	-	-	-	-	-	3531	3531	2252.4	637.91
44-45	|	-	-	-	-	-	-	-	334	334	287.0	858.00
TSN(1000)	|	25873	113324	135081	146591	136339	76779	17048	5707	656743	-	-
TSB(1000 kg)	|	8865.8	47886.7	56836.2	67691.8	61373.8	37274.8	8910.8	3731.6	-	292571.4	-

Mean length (cm)	32.81	35.43	35.07	36.32	36.01	37.22	38.22	42.55	-	-	-
Mean weight (g)	342.66	422.56	420.76	461.77	450.15	485.48	522.69	653.82	-	-	445.49

Variable: Abundance

EstLayer: 1

Stratum: 124

SpecCat: MAKRELL

LenGrp (age →)	2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	-	1943	-	-	-	-	-	-	-	-	1943	492.6	253.49
30-31	-	4854	-	-	-	-	-	-	-	-	4854	1333.6	274.73
31-32	-	5684	4255	1177	-	-	-	-	-	-	11116	3216.6	289.37
32-33	-	1156	30107	5504	-	-	-	-	-	-	36767	11852.4	322.37
33-34	-	280	38666	10692	1686	-	-	-	-	-	51324	17680.8	344.49
34-35	6402	9360	24392	3083	7888	-	-	-	-	-	51126	19374.0	378.95
35-36	-	5201	8099	21389	32714	18569	-	-	-	-	85973	35544.6	413.44
36-37	-	-	3902	3740	20512	6389	26977	9417	-	-	70938	31279.5	440.94
37-38	-	-	206	7085	11150	13149	30424	-	-	7513	69527	32928.6	473.61
38-39	-	-	-	5864	2206	5343	2517	2561	1286	-	19777	9793.6	495.21
39-40	-	-	-	-	2464	-	-	3093	-	-	5557	2977.8	535.88
40-41	-	-	-	-	-	303	578	4731	-	-	5611	3238.1	577.05
41-42	-	-	-	-	-	23	257	-	-	-	280	163.7	584.47
42-43	-	-	-	-	-	-	22	-	-	257	280	163.0	582.88
TSN(1000)	6402	28478	109627	58535	78620	43777	60776	19801	1286	7770	415072	-	-
TSB(1000 kg)	2482.3	9765.0	38764.6	23952.4	33939.9	19190.3	27704.9	9882.2	561.1	3796.3	-	170039.0	-
Mean length (cm)	34.00	32.47	33.13	34.83	35.61	36.15	36.64	37.68	38.00	37.17	-	-	-
Mean weight (g)	387.74	342.90	353.60	409.20	431.70	438.37	455.86	499.07	436.35	488.59	-	-	409.66

Variable: Abundance

EstLayer: 1

Stratum: 125

SpecCat: MAKRELL

LenGrp (age →)	1	2	3	4	5	6	7	8	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)

27-28	|	1976	-	-	-	-	-	-	-	-	-	1976	393.2	199.00
28-29	|	-	-	6455	-	-	-	-	-	-	-	6455	1538.2	238.29
29-30	|	-	-	39835	-	-	-	-	-	-	-	39835	9891.6	248.32
30-31	|	-	9993	98516	-	-	-	-	-	-	-	108509	29027.3	267.51
31-32	|	-	-	122859	15760	-	-	-	-	-	-	138620	39217.0	282.91
32-33	|	-	-	58867	68281	-	-	-	-	-	-	127148	39096.6	307.49
33-34	|	-	-	22812	105845	194	-	-	-	-	-	128850	42853.4	332.58
34-35	|	-	-	25587	37451	97	4950	-	-	-	-	68085	24709.0	362.92
35-36	|	-	-	-	-	5862	33395	97	-	97	-	39450	15738.1	398.93
36-37	|	-	-	-	-	10492	6059	16338	8537	-	-	41426	17456.4	421.39
37-38	|	-	-	-	-	-	19505	8239	-	-	-	27744	12373.2	445.98
38-39	|	-	-	-	-	-	144	2880	48	2832	-	5905	3058.9	517.99
40-41	|	-	-	-	-	-	-	-	-	-	1976	1976	879.3	445.00
TSN(1000)	|	1976	9993	374931	227337	16645	64053	27553	8585	2929	1976	735979	-	-
TSB(1000 kg)	|	393.2	2673.1	107731.6	74320.8	6978.5	25975.4	12266.1	3556.6	1457.7	879.3	-	236232.2	-
Mean length (cm)	|	27.00	30.00	30.96	32.73	35.60	35.63	36.50	36.01	37.90	40.00	-	-	-
Mean weight (g)	|	199.00	267.50	287.34	326.92	419.25	405.53	445.17	414.26	497.67	445.00	-	-	320.98

Variable: Abundance

EstLayer: 1

Stratum: 126

SpecCat: MAKRELL

LenGrp	age	1	2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
27-28	|	2550	-	-	-	-	-	-	-	-	2550	586.4	230.00
28-29	|	-	6216	3658	-	-	-	-	-	-	9874	2221.0	224.93
29-30	|	-	33792	33051	-	-	-	-	-	-	66843	16799.1	251.32
30-31	|	-	-	175925	-	-	-	-	-	-	175925	46666.8	265.27
31-32	|	-	3112	102733	41308	-	-	-	-	-	147153	41563.1	282.45
32-33	|	-	-	30481	55120	-	-	-	-	-	85601	26075.4	304.61
33-34	|	-	-	11010	39187	7431	18684	-	-	-	76311	24744.9	324.26
34-35	|	-	-	-	35405	8506	-	-	-	-	43911	15562.4	354.41
35-36	|	-	-	-	-	7342	7448	10337	-	4777	29904	11512.3	384.98
36-37	|	-	-	-	3308	7438	6230	1038	15598	-	33612	13864.6	412.48
37-38	|	-	-	-	-	2564	3112	6755	14762	-	27194	11474.4	421.95
38-39	|	-	-	-	-	-	1038	1103	5595	4959	12695	5880.5	463.20
39-40	|	-	-	-	-	-	-	3273	-	-	3273	1544.4	471.89
41-42	|	-	-	-	-	-	-	-	2550	-	2550	1343.7	527.00

TSN(1000)	2550	43120	356858	174328	33281	36513	22506	38506	9736	717398	-	-
TSB(1000 kg)	586.4	10714.5	97664.6	54904.8	12347.3	13261.3	9246.6	16961.0	4152.7	-	219839.2	-
Mean length (cm)	27.00	29.00	30.44	32.47	34.68	34.40	36.38	37.01	36.53	-	-	-
Mean weight (g)	230.00	248.48	273.68	314.95	371.00	363.20	410.85	440.48	426.51	-	-	306.44

Variable: Abundance

EstLayer: 1

Stratum: 127

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	-	18053	-	-	-	-	-	-	-	18053	4038.1	223.68
29-30	16007	57578	-	-	-	-	-	-	-	73584	17591.9	239.07
30-31	-	280702	2739	-	-	-	-	-	-	283441	74259.4	261.99
31-32	-	217404	14671	-	-	-	-	-	-	232075	64598.5	278.35
32-33	-	89814	51352	4111	-	-	-	-	-	145276	43693.8	300.76
33-34	-	20530	69095	-	-	-	-	-	-	89625	29334.9	327.31
34-35	-	4188	11692	-	-	-	-	-	-	15879	5615.8	353.65
35-36	-	-	-	11970	-	2737	3670	-	-	18377	7170.2	390.16
36-37	-	-	-	14504	-	-	-	-	-	14504	5783.8	398.78
37-38	-	-	-	-	4869	5467	10362	-	-	20698	9263.2	447.54
38-39	-	-	-	-	-	680	680	-	-	1360	722.2	531.00
39-40	-	-	-	-	-	3423	687	-	-	4110	2246.5	546.57
40-41	-	-	-	-	-	-	-	680	-	680	463.1	681.00
41-42	-	-	-	-	-	-	680	-	-	680	353.6	520.00
42-43	-	-	-	-	-	-	-	-	2750	2750	1655.5	602.00
TSN(1000)	16007	688268	149549	30584	4869	12308	16079	680	2750	921094	-	-
TSB(1000 kg)	3972.0	186520.8	47364.0	11745.6	2258.0	5662.7	7148.8	463.1	1655.5	-	266790.6	-
Mean length (cm)	29.00	30.55	32.48	35.07	37.00	37.17	36.84	40.00	42.00	-	-	-
Mean weight (g)	248.14	271.00	316.71	384.05	463.75	460.08	444.60	681.00	602.00	-	-	289.65

Variable: Abundance

EstLayer: 1

Stratum: 128

SpecCat: MAKRELL

LenGrp		age 2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	|	-	558	-	-	-	-	-	-	-	-	-	558	117.1	210.00
29-30	|	5844	6314	-	-	-	-	-	-	-	-	-	12158	3033.4	249.50
30-31	|	10178	27297	-	-	-	-	-	-	-	-	-	37475	9962.7	265.85
31-32	|	317	29575	17957	-	-	-	-	-	-	-	-	47849	13478.8	281.69
32-33	|	-	8499	14914	1263	-	-	-	-	-	-	-	24676	7452.2	302.01
33-34	|	-	8257	4655	1350	475	-	-	-	-	-	-	14736	4806.1	326.14
34-35	|	-	-	3309	1269	3885	-	-	-	-	-	-	8463	3020.2	356.87
35-36	|	-	847	-	1809	1857	4649	-	-	-	-	-	9162	3671.1	400.69
36-37	|	-	-	-	1050	3491	6207	212	-	-	-	-	10961	4678.3	426.82
37-38	|	-	-	-	758	3667	5419	7920	2906	273	272	-	21216	9435.4	444.74
38-39	|	-	-	-	1899	-	470	2960	2031	850	425	-	8635	4161.9	482.00
39-40	|	-	-	-	-	470	774	3437	974	190	-	106	5950	3015.5	506.81
40-41	|	-	-	-	-	-	775	774	106	964	-	-	2620	1395.1	532.49
41-42	|	-	-	-	-	-	-	53	347	619	631	-	1649	904.7	548.58
42-43	|	-	-	-	-	-	-	-	190	212	121	-	524	313.0	597.69
43-44	|	-	-	-	-	-	-	-	53	-	-	-	53	35.1	661.00
TSN(1000)	|	16340	81345	40835	9400	13845	18295	15355	6606	3109	1449	106	206684	-	-
TSB(1000 kg)	|	4294.8	22783.7	12339.0	3733.8	5634.3	7903.3	7284.8	3100.1	1603.6	749.5	53.7	-	69480.7	-
Mean length (cm)	|	29.66	30.84	31.84	35.05	35.57	36.39	37.79	38.05	39.46	39.45	39.00	-	-	-
Mean weight (g)	|	262.85	280.09	302.17	397.23	406.97	432.00	474.42	469.29	515.81	517.26	505.50	-	-	336.17

Variable: Abundance

EstLayer: 1

Stratum: 140

SpecCat: MAKRELL

LenGrp		age 3	4	5	6	7	8	9	10	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	|	-	-	-	-	-	-	-	-	78	78	-	-
33-34	|	79	823	-	-	-	-	-	-	-	902	281.4	311.94
34-35	|	-	-	-	2312	-	-	-	-	-	2312	872.3	377.35
35-36	|	-	-	5210	5096	2233	-	-	-	-	12539	5254.6	419.07
36-37	|	-	710	-	8896	7757	4116	-	-	-	21480	9819.9	457.17
37-38	|	-	-	6743	10420	15877	5210	-	-	-	38249	17950.8	469.31
38-39	|	-	158	1105	10386	237	3721	4466	-	-	20072	9879.2	492.19

39-40	-	-	-	14929	-	-	-	-	-	14929	7874.6	527.46
40-41	-	-	-	7330	-	-	-	-	-	7330	4075.8	556.08
41-42	-	-	-	1725	-	-	-	-	-	1725	1090.8	632.50
42-43	-	-	-	-	-	823	-	823	-	1646	1096.4	665.96
TSN(1000)	79	1691	13058	61093	26104	13870	4466	823	78	121262	-	-
TSB(1000 kg)	25.7	651.8	5906.5	29883.1	12191.3	6816.3	2244.6	476.5	-	-	58195.8	-
Mean length (cm)	33.00	34.73	36.29	37.71	36.54	37.27	38.00	42.00	20.00	-	-	-
Mean weight (g)	326.00	385.37	452.34	489.14	467.03	491.44	502.65	578.88	-	-	-	480.23

Variable: Abundance

EstLayer: 1

Stratum: 142

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
31-32	-	187	-	-	-	-	-	-	-	-	-	187	54.2	289.94
32-33	-	407	-	-	-	-	-	-	-	-	-	407	119.0	292.15
33-34	-	-	108	-	608	-	-	-	-	-	-	716	249.4	348.39
34-35	1591	-	-	-	-	-	-	-	-	-	-	1591	570.2	358.33
35-36	-	365	126	-	1094	1490	486	-	-	-	-	3561	1460.0	410.00
36-37	-	-	-	921	3361	774	84	-	-	-	-	5140	2200.4	428.08
37-38	486	-	1377	976	850	1096	1904	728	-	-	-	7416	3474.4	468.48
38-39	-	-	-	-	192	1909	1000	84	197	66	-	3448	1777.5	515.53
39-40	-	-	-	42	-	997	831	-	-	-	-	1870	924.7	494.40
40-41	-	-	-	-	-	252	438	-	569	-	-	1259	674.5	535.60
41-42	-	-	-	-	-	-	-	307	-	-	239	546	319.6	585.45
42-43	-	-	-	-	-	-	-	-	65	-	-	65	39.4	606.00
43-44	-	-	-	-	-	-	-	-	-	-	122	122	85.2	700.00
TSN(1000)	2077	959	1612	1938	6105	6517	4744	1120	832	66	360	26329	-	-
TSB(1000 kg)	802.3	323.3	705.4	879.1	2598.9	3049.4	2306.3	577.0	449.8	32.0	225.0	-	11948.5	-
Mean length (cm)	34.70	32.95	36.58	36.57	35.72	37.14	37.62	38.17	39.68	38.00	41.68	-	-	-
Mean weight (g)	386.30	337.18	437.69	453.49	425.72	467.90	486.17	515.33	540.91	486.00	624.55	-	-	453.82

Variable: Abundance

EstLayer: 1

Stratum: 143

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	4902	-	-	-	-	-	-	-	-	-	-	4902	1250.0	255.00
30-31	-	8052	-	-	-	-	-	-	-	-	-	8052	2254.6	280.00
31-32	-	-	9645	-	-	-	-	-	-	-	-	9645	2959.6	306.85
32-33	-	13682	12996	-	-	-	-	-	-	-	-	26678	8830.9	331.02
33-34	-	-	25208	6968	-	-	-	-	-	-	-	32176	11333.5	352.23
34-35	-	7400	91	11945	-	6123	-	-	-	-	-	25559	9852.2	385.47
35-36	-	-	-	33580	27686	4940	4344	2454	-	-	-	73004	30808.7	422.02
36-37	-	-	-	1031	41888	22665	28582	-	-	-	-	94166	42017.7	446.21
37-38	-	-	2776	6321	9983	28683	33037	122	91	-	-	81012	39216.5	484.08
38-39	-	-	121	-	1729	3464	16173	2465	-	2366	693	27010	13690.2	506.86
39-40	-	-	-	-	-	4008	-	-	-	-	-	4008	2071.2	516.75
40-41	-	-	61	-	-	1399	3216	-	-	-	-	4676	2667.1	570.34
41-42	-	-	-	-	-	699	-	-	-	-	-	699	397.3	568.00
42-43	-	-	-	-	-	31	-	-	-	-	-	31	19.8	644.50
TSN(1000)	4902	29135	50898	59846	81286	72011	85351	5041	91	2366	693	391618	-	-
TSB(1000 kg)	1250.0	9531.3	17912.8	24487.0	36160.9	32767.5	41337.6	2401.8	42.1	1147.5	330.4	-	167368.9	-
Mean length (cm)	29.00	31.96	32.61	34.80	35.82	36.55	36.87	36.52	37.00	38.00	38.00	-	-	-
Mean weight (g)	255.00	327.15	351.93	409.17	444.86	455.03	484.33	476.50	461.93	485.00	477.00	-	-	427.38

Variable: Abundance

EstLayer: 1

Stratum: 144

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	11488	-	-	-	-	-	-	-	-	-	11488	2898.0	252.26
30-31	20458	72892	-	-	-	-	-	-	-	-	93349	24856.4	266.27
31-32	-	101763	50238	-	-	-	-	-	-	-	152001	44040.5	289.74
32-33	-	60276	80432	-	-	-	-	-	-	-	140708	43694.9	310.54
33-34	-	25071	43720	-	-	-	-	-	-	-	68790	23376.6	339.82
34-35	-	3952	4177	22044	-	-	-	-	-	-	30172	10795.9	357.81
35-36	-	-	-	-	-	18777	-	-	-	-	18777	7682.9	409.17

36-37	-	-	-	5569	7654	-	9371	-	-	-	22594	9765.7	432.23
37-38	-	-	-	10321	1397	6984	7753	1397	-	-	27851	12485.1	448.28
38-39	-	-	-	-	4110	-	7668	5889	-	-	17667	8254.0	467.20
39-40	-	-	-	-	-	-	-	-	2800	-	2800	1440.4	514.50
40-41	-	-	-	-	-	-	1304	-	-	-	1304	713.4	547.00
45-46	-	-	-	-	-	-	-	-	-	1400	1400	1149.2	821.00
TSN(1000)	31946	263953	178567	37934	13160	25761	26096	7286	2800	1400	588901	-	-
TSB(1000 kg)	8432.4	77154.9	56211.6	14946.6	5917.5	10877.3	11763.6	3259.4	1440.4	1149.2	-	191152.9	-
Mean length (cm)	29.64	31.19	32.01	35.11	36.73	35.54	37.08	37.81	39.00	45.00	-	-	-
Mean weight (g)	263.96	292.31	314.79	394.02	449.66	422.24	450.77	447.37	514.50	821.00	-	-	324.59

Variable: Abundance

EstLayer: 1

Stratum: 145

SpecCat: MAKRELL

	age										
LenGrp	2	3	4	5	6	7	8	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	3745	1717	-	-	-	-	-	-	5462	1291.9	236.52
29-30	-	72586	-	-	-	-	-	-	72586	18814.3	259.20
30-31	9666	148130	-	-	-	-	-	-	157796	42507.6	269.38
31-32	-	188806	21306	-	-	-	-	-	210113	61790.2	294.08
32-33	-	56809	63509	8590	-	-	-	-	128908	39735.5	308.25
33-34	-	7742	42424	-	9677	-	-	-	59843	19916.5	332.81
34-35	-	7506	29768	-	-	3753	-	-	41027	14560.8	354.91
35-36	-	-	-	11046	-	5584	-	-	16630	6302.5	378.99
36-37	-	-	-	1935	12869	5588	-	-	20392	8481.2	415.90
37-38	-	-	-	-	-	5462	5462	-	10924	5372.0	491.75
38-39	-	-	-	-	-	5476	5813	-	11289	5305.4	469.97
39-40	-	-	-	-	-	1699	-	-	1699	800.4	471.00
40-41	-	-	-	-	-	-	-	3763	3763	1787.3	475.00
TSN(1000)	13411	483296	157006	21571	22547	27562	11275	3763	740431	-	-
TSB(1000 kg)	3406.3	137901.9	50068.7	7687.3	8555.8	11775.0	5483.2	1787.3	-	226665.6	-
Mean length (cm)	29.44	30.58	32.51	33.89	34.71	36.31	37.52	40.00	-	-	-
Mean weight (g)	253.99	285.34	318.90	356.37	379.48	427.22	486.30	475.00	-	-	306.13

Variable: Abundance

EstLayer: 1

Stratum: 146

SpecCat: MAKRELL

LenGrp		2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
	age											
28-29	|	-	7537	-	-	-	-	-	-	7537	1785.2	236.84
29-30	|	-	53478	-	-	-	-	-	-	53478	13268.4	248.11
30-31	|	9912	132516	18956	-	-	-	-	-	161385	42894.6	265.79
31-32	|	-	134269	19610	-	-	-	-	-	153879	43857.3	285.01
32-33	|	-	54175	36813	-	-	-	-	-	90987	27548.5	302.77
33-34	|	-	-	55219	3022	-	-	-	-	58240	19152.9	328.86
34-35	|	-	-	15695	4528	-	-	-	-	20223	7134.8	352.81
35-36	|	-	-	-	17356	1659	8147	1659	-	28820	10968.1	380.58
36-37	|	-	-	-	-	1500	-	-	3143	4643	1936.1	417.03
37-38	|	-	-	-	-	-	6059	7437	-	13496	6016.4	445.80
38-39	|	-	-	-	5751	-	4513	-	-	10264	4807.0	468.34
40-41	|	-	-	-	-	-	-	-	1660	1660	982.6	592.00
TSN(1000)	|	9912	381976	146293	30656	3158	18719	9096	4803	604612	-	-
TSB(1000 kg)	|	2638.4	104630.6	45641.5	11917.7	1284.5	7908.3	4030.0	2300.9	-	180351.9	-
Mean length (cm)	|	30.00	30.46	32.20	35.22	35.47	36.37	36.64	37.38	-	-	-
Mean weight (g)	|	266.17	273.92	311.99	388.76	406.75	422.48	443.08	479.07	-	-	298.29

Variable: Abundance

EstLayer: 1

Stratum: 147

SpecCat: MAKRELL

LenGrp		2	3	4	5	6	7	8	9	Number (1E3)	Biomass (1E3kg)	Mean W (g)
	age											
29-30	|	14692	27981	-	-	-	-	-	-	42673	10751.4	251.95
30-31	|	6376	129368	-	-	-	-	-	-	135744	36436.8	268.42
31-32	|	-	119183	-	-	-	-	-	-	119183	34520.1	289.64
32-33	|	-	24285	80529	-	-	-	-	-	104814	32697.5	311.96
33-34	|	-	8512	46418	1963	-	-	-	-	56893	18673.4	328.22
34-35	|	-	-	3172	8796	11803	-	-	-	23772	8502.0	357.65
35-36	|	-	-	3646	-	6347	6040	5875	-	21908	8537.0	389.68

36-37	|	-	-	-	-	1955	3640	3910	-	9505	4076.9	428.91
37-38	|	-	-	-	-	5135	-	-	-	5135	2277.6	443.54
38-39	|	-	-	-	-	-	-	3176	2125	5301	2443.7	461.02
39-40	|	-	-	-	-	-	-	1967	-	1967	1140.7	580.00
40-41	|	-	-	-	-	-	-	1955	1213	3168	1953.6	616.57
TSN(1000)	|	21068	309328	133765	10759	25241	9680	16883	3338	530062	-	-
TSB(1000 kg)	|	5299.2	86856.2	42932.4	3681.5	9979.0	3851.4	7800.7	1610.3	-	162010.7	-
Mean length (cm)	|	29.30	30.53	32.48	33.82	35.02	35.38	36.84	38.73	-	-	-
Mean weight (g)	|	251.53	280.79	320.95	342.19	395.35	397.89	462.03	482.41	-	-	305.64

Variable: Abundance

EstLayer: 1

Stratum: 148

SpecCat: MAKRELL

LenGrp	age	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	|	-	11095	-	-	-	-	-	-	-	-	-	11095	2747.3	247.61
30-31	|	8463	19602	-	-	-	-	-	-	-	-	-	28064	7386.9	263.21
31-32	|	-	69408	-	-	-	-	-	-	-	-	-	69408	20504.0	295.41
32-33	|	-	44526	33616	254	-	-	-	-	-	-	-	78396	25040.6	319.41
33-34	|	-	964	44345	-	-	-	-	-	-	-	-	45309	15180.2	335.04
34-35	|	-	-	14242	755	-	1490	-	-	-	-	-	16487	5913.9	358.71
35-36	|	-	-	-	-	9702	205	-	1040	-	-	-	10947	4223.9	385.87
36-37	|	-	-	-	3843	6924	2178	-	-	-	-	-	12944	5335.9	412.22
37-38	|	-	-	-	-	926	4063	102	2083	13799	-	-	20974	9559.8	455.79
38-39	|	-	-	-	-	206	2436	677	815	191	-	-	4325	2104.3	486.52
39-40	|	-	-	-	-	-	1229	859	568	-	-	5498	8154	4609.4	565.27
40-41	|	-	-	-	-	-	-	-	103	477	-	-	580	313.6	540.68
41-42	|	-	-	-	-	-	191	-	-	-	52	-	243	153.6	632.28
42-43	|	-	-	-	-	-	-	-	-	146	-	-	146	80.4	551.44
TSN(1000)	|	8463	145595	92203	4852	17758	11792	1639	4609	14613	52	5498	307072	-	-
TSB(1000 kg)	|	2135.0	43037.0	30674.2	1921.3	7095.2	5502.7	866.5	2147.5	6614.6	34.2	3125.4	-	103153.7	-
Mean length (cm)	|	30.00	31.03	32.79	35.48	35.53	36.88	38.46	37.04	37.16	41.00	39.00	-	-	-
Mean weight (g)	|	252.28	295.59	332.68	395.96	399.55	466.66	528.81	465.93	452.65	663.00	568.50	-	-	335.93

Variable: Abundance

EstLayer: 1

Stratum: 161

SpecCat: MAKRELL

	age												
LenGrp	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	422	-	-	-	-	-	-	-	-	422	152.5	361.00
34-35	-	422	-	-	-	-	-	-	-	-	422	162.2	384.00
35-36	493	52	1901	71	1689	71	-	-	-	-	4277	1694.6	396.24
36-37	-	493	563	1479	2112	3097	71	-	-	-	7815	3353.0	429.05
37-38	-	1267	1830	2394	6089	1479	1127	71	422	-	14679	6696.7	456.21
38-39	-	563	1338	335	2428	829	2042	1338	123	-	8995	4437.6	493.35
39-40	-	-	-	353	809	3732	1056	71	-	71	6091	3206.6	526.44
40-41	-	-	-	-	71	1390	668	1231	-	71	3430	1958.4	570.90
41-42	-	-	-	-	422	71	563	597	71	71	1795	1067.5	594.73
42-43	-	-	-	845	422	71	422	-	-	-	1760	1190.0	676.16
43-44	-	-	-	-	-	-	-	-	71	-	71	51.8	734.00
44-45	-	-	-	-	-	-	-	422	-	-	422	350.5	830.00
TSN(1000)	493	3220	5633	5475	14042	10738	5950	3730	686	212	50179	-	-
TSB(1000 kg)	203.9	1393.7	2514.0	2698.5	6601.4	5280.4	3055.5	2134.4	318.8	120.7	-	24321.3	-
Mean length (cm)	35.00	35.94	36.46	37.67	37.18	37.92	38.76	39.82	38.21	40.00	-	-	-
Mean weight (g)	413.71	432.80	446.33	492.85	470.12	491.75	513.54	572.26	464.45	570.00	-	-	484.69

Variable: Abundance

EstLayer: 1

Stratum: 162

SpecCat: MAKRELL

	age												
LenGrp	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	22668	-	-	-	-	-	-	-	-	-	22668	5576.3	246.00
29-30	99300	-	-	-	-	-	-	-	-	-	99300	26421.4	266.08
30-31	289521	-	-	-	-	-	-	-	-	-	289521	81787.5	282.49
31-32	169984	130584	-	-	-	-	-	-	-	-	300569	93216.2	310.13
32-33	123964	149301	-	-	-	-	-	-	-	-	273265	89963.1	329.22
33-34	24027	147030	-	-	-	-	-	-	-	-	171057	60592.9	354.23
34-35	-	-	85957	34918	31180	9448	-	-	-	-	161502	60917.1	377.19

35-36	-	6839	-	37247	73136	12443	-	-	-	-	129665	52788.9	407.12
36-37	-	-	4166	28711	102801	22423	-	-	-	-	158102	68366.1	432.42
37-38	-	-	3935	28910	78074	97245	17848	-	16920	-	242932	112212.7	461.91
38-39	-	-	-	-	6046	58819	62889	-	-	-	127754	62325.9	487.86
39-40	-	-	-	-	2446	-	7576	37654	-	-	47676	25707.6	539.22
40-41	-	-	-	-	-	-	9221	22383	-	-	31604	17547.5	555.24
41-42	-	-	-	-	-	5486	608	1016	-	5080	12191	8300.6	680.88
42-43	-	-	-	-	-	-	-	-	-	10974	10974	7685.8	700.35
43-44	-	-	-	-	-	-	-	608	-	-	608	481.2	791.00
TSN(1000)	729465	433754	94059	129786	293683	205865	98143	61661	16920	16054	2079390	-	-
TSB(1000 kg)	215510.1	144847.0	37008.7	53187.9	124646.7	96516.7	49186.0	33558.5	7689.4	11739.7	-	773890.7	-
Mean length (cm)	30.47	32.09	34.21	35.40	35.87	37.02	38.10	39.44	37.00	41.68	-	-	-
Mean weight (g)	295.44	333.94	393.46	409.81	424.43	468.84	501.17	544.24	454.46	731.25	-	-	372.17

Variable: Abundance

EstLayer: 1

Stratum: 166

SpecCat: MAKRELL

	age												
LenGrp	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
28-29	746	-	-	-	-	-	-	-	-	-	746	211.9	284.00
29-30	28077	-	-	-	-	-	-	-	-	-	28077	7860.4	279.96
30-31	148434	-	-	-	-	-	-	-	-	-	148434	42730.5	287.88
31-32	143896	17465	-	-	-	-	-	-	-	-	161362	48710.5	301.87
32-33	54085	44405	89682	-	-	-	-	-	-	-	188171	61310.1	325.82
33-34	2272	123633	6486	-	-	-	-	-	-	-	132391	46130.0	348.44
34-35	-	30030	-	27360	-	-	-	-	-	-	57389	21421.9	373.27
35-36	-	-	18526	6172	3125	-	-	-	-	-	27823	11772.9	423.14
36-37	-	-	90	26136	17448	37247	-	-	-	-	80922	36140.2	446.61
37-38	-	-	-	13345	3543	12921	70119	1250	-	-	101179	47662.3	471.07
38-39	-	-	-	853	7310	4072	7812	-	16489	-	36535	19311.5	528.57
39-40	-	-	-	-	-	10200	7735	3942	99	1484	23460	13113.6	558.97
40-41	-	-	-	-	-	1891	1329	7560	853	-	11633	6988.7	600.77
41-42	-	-	-	-	-	-	-	5076	-	-	5076	3449.8	679.59
42-43	-	-	-	-	-	-	646	-	726	1214	2585	1848.9	715.10
43-44	-	-	-	-	-	-	-	605	-	1335	1940	1458.8	751.77
44-45	-	-	-	-	302	-	-	262	-	-	563	494.4	877.40
45-46	-	-	-	-	-	-	-	261	-	-	261	210.1	804.00

TSN(1000)	377510	215533	114784	73866	31728	66332	87640	18957	18167	4033	1008549	-	-
TSB(1000 kg)	112644.7	73749.3	39211.4	32026.6	15701.9	31549.9	42108.3	11692.3	9437.8	2704.1	-	370826.4	-
Mean length (cm)	30.61	32.77	32.54	35.38	36.55	36.89	37.35	40.08	38.26	41.23	-	-	-
Mean weight (g)	298.39	342.17	341.61	433.58	494.89	475.63	480.47	616.79	519.51	670.54	-	-	367.68

Variable: Abundance

EstLayer: 1

Stratum: 170

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
33-34	23	-	-	-	-	-	-	-	23	6.8	295.00
35-36	-	-	23	-	-	-	-	-	23	7.6	333.00
36-37	-	23	-	23	46	-	-	-	92	38.6	421.25
37-38	-	-	46	69	46	23	-	-	183	81.7	445.37
38-39	-	-	-	92	46	-	23	-	161	83.2	518.43
39-40	-	-	-	-	-	46	46	-	92	46.2	503.25
40-41	-	-	-	-	-	23	23	-	46	24.4	531.50
41-42	-	-	-	-	-	-	46	-	46	29.9	653.00
43-44	-	-	-	-	-	-	-	23	23	15.0	655.00
TSN(1000)	23	23	69	183	138	92	138	23	688	-	-
TSB(1000 kg)	6.8	10.8	28.3	87.2	63.5	44.8	77.0	15.0	-	333.4	-
Mean length (cm)	33.00	36.00	36.33	37.38	37.00	38.75	39.67	43.00	-	-	-
Mean weight (g)	295.00	473.00	411.67	475.37	461.33	488.25	560.00	655.00	-	-	484.73

Variable: Abundance

EstLayer: 1

Stratum: 171

SpecCat: MAKRELL

LenGrp	age 6	7	8	9	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
36-37	30	-	-	-	-	30	14.1	471.00
37-38	-	78	90	-	-	168	69.0	411.64

38-39	30	87	-	-	-	117	53.5	455.74
39-40	-	-	-	108	-	108	56.1	520.55
40-41	-	28	-	-	-	28	14.2	514.00
41-42	-	-	-	-	30	30	15.7	525.00
TSN(1000)	60	193	90	108	30	480	-	-
TSB(1000 kg)	28.4	84.9	37.5	56.1	15.7	-	222.5	-
Mean length (cm)	37.00	37.88	37.00	39.00	41.00	-	-	-
Mean weight (g)	474.00	440.32	417.33	520.55	525.00	-	-	463.50

Variable: Abundance

EstLayer: 1

Stratum: 182

SpecCat: MAKRELL

	age												
LenGrp	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1378	-	-	-	-	-	-	-	-	-	-	1378	445.1	323.00
33-34	375	1378	1378	1378	-	-	-	-	-	-	-	4509	1660.2	368.23
34-35	-	-	-	9646	-	-	-	-	-	-	-	9646	3724.8	386.14
35-36	-	-	104	34572	4134	-	-	-	-	-	-	38811	16018.1	412.72
36-37	-	-	-	17901	11182	20672	-	-	-	-	-	49754	22182.6	445.85
37-38	-	-	1499	1692	8961	19210	7837	-	-	-	-	39199	18595.3	474.38
38-39	-	-	-	-	261	11548	3139	-	1874	-	-	16822	8277.8	492.07
39-40	-	-	-	-	5009	2625	1645	261	-	-	-	9541	5043.8	528.65
40-41	-	-	-	-	-	-	3134	741	-	1754	-	5629	3153.1	560.17
41-42	-	-	-	-	-	1389	-	-	-	-	-	1389	857.1	617.19
42-43	-	-	-	-	-	-	-	-	-	-	1859	1859	1176.6	633.06
43-44	-	-	-	-	-	-	-	375	-	52	-	428	310.5	726.27
TSN(1000)	1753	1378	2981	65190	29548	55443	15755	1378	1874	1807	1859	178964	-	-
TSB(1000 kg)	570.2	492.0	1270.8	27027.8	13655.6	26522.4	7861.4	839.2	955.6	1073.6	1176.6	-	81445.1	-
Mean length (cm)	30.64	33.00	35.08	35.14	36.69	37.03	38.00	40.63	38.00	40.09	42.00	-	-	-
Mean weight (g)	325.35	357.00	426.26	414.60	462.15	478.37	498.97	609.22	510.00	594.23	633.06	-	-	455.09

Variable: Abundance

EstLayer: 1

Stratum: 184

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
29-30	1692	-	-	-	-	-	-	-	-	-	-	1692	455.1	269.00
30-31	-	15228	-	-	-	-	-	-	-	-	-	15228	4595.4	301.78
31-32	-	25249	7665	-	-	-	-	-	-	-	-	32915	9950.8	302.32
32-33	-	48762	34862	-	-	-	-	-	-	-	-	83624	28177.0	336.95
33-34	-	42059	26973	15102	-	-	-	6822	-	-	-	90956	31516.6	346.50
34-35	-	-	-	21976	33786	-	42924	-	-	-	-	98685	37726.4	382.29
35-36	-	-	-	-	48951	33610	21988	-	10115	-	-	114663	46986.5	409.78
36-37	-	-	-	43240	101068	82605	13710	13710	-	-	-	254333	111406.4	438.03
37-38	-	-	-	15598	19751	118296	52309	34023	-	-	-	239977	113134.7	471.44
38-39	-	-	-	-	-	48942	30717	50643	13820	-	-	144122	71329.3	494.92
39-40	-	-	-	-	-	-	13054	14486	21290	2611	-	51442	27540.0	535.36
40-41	-	-	-	-	-	-	-	-	13850	5233	-	19083	11570.6	606.34
41-42	-	-	-	-	-	-	-	6911	5240	-	-	12151	7152.1	588.61
42-43	-	-	-	-	2304	-	-	-	-	-	-	2304	1458.2	633.00
43-44	-	-	-	-	-	-	-	-	-	-	2620	2620	1873.3	715.00
TSN(1000)	1692	131299	69501	95915	205859	283453	174702	126595	64315	7844	2620	1163794	-	-
TSB(1000 kg)	455.1	43048.6	23350.6	40648.7	86541.7	130679.7	77596.4	62173.8	33845.0	4659.6	1873.3	-	504872.4	-
Mean length (cm)	29.00	31.90	32.28	35.23	35.60	36.64	36.26	37.52	38.53	39.67	43.00	-	-	-
Mean weight (g)	269.00	327.87	335.98	423.80	420.39	461.03	444.17	491.12	526.24	594.06	715.00	-	-	433.82

Variable: Abundance

EstLayer: 1

Stratum: 186

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	12	13	14	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
30-31	1032	-	-	-	-	-	-	-	-	-	-	-	1032	278.7	270.00
31-32	9034	-	-	-	-	-	-	-	-	-	-	-	9034	2709.7	299.95
32-33	16879	7683	-	-	-	-	-	-	-	-	-	-	24561	7931.0	322.91
33-34	2088	53541	-	-	-	-	-	-	-	-	-	-	55629	18800.2	337.96
34-35	1044	12214	23668	-	15440	11105	-	-	-	-	-	-	63471	23479.1	369.92
35-36	-	-	5231	19645	40200	33915	-	-	-	-	-	-	98992	40150.7	405.60
36-37	-	-	27078	20355	78997	5233	2093	10177	-	-	-	-	143933	62054.5	431.14

37-38	-	-	-	193	68851	105264	11140	19848	-	20354	-	-	225650	104990.0	465.28
38-39	-	-	-	-	13459	42556	70173	15480	-	-	-	-	141668	70384.1	496.83
39-40	-	-	-	-	13571	4481	14062	1143	7834	-	-	-	41092	21943.9	534.02
40-41	-	-	-	-	-	-	1751	25010	7791	-	-	-	34552	20469.7	592.43
41-42	-	-	-	-	-	-	818	97	-	-	-	-	915	569.6	622.70
42-43	-	-	-	-	-	-	-	5019	-	-	97	-	5116	3172.4	620.08
43-44	-	-	-	-	-	-	-	-	-	-	-	3397	3397	2265.8	667.00
TSN(1000)	30077	73438	55977	40193	230518	202554	100038	76775	15625	20354	97	3397	849042	-	-
TSB(1000 kg)	9504.5	25221.2	22725.4	17159.5	100081.4	93494.2	50846.0	39389.6	8957.4	9471.4	83.1	2265.8	-	379199.4	-
Mean length (cm)	31.77	33.06	35.06	35.52	36.28	36.73	38.05	38.41	39.50	37.00	42.00	43.00	-	-	-
Mean weight (g)	316.01	343.44	405.98	426.93	434.16	461.58	508.27	513.06	573.26	465.33	858.00	667.00	-	-	446.62

Variable: Abundance

EstLayer: 1

Stratum: 202

SpecCat: MAKRELL

LenGrp	age 2	4	5	6	7	8	9	10	11	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	-	53	-	-	-	-	-	-	-	-	53	18.5	350.00
33-34	-	1519	848	-	-	-	-	-	-	-	2367	844.2	356.69
34-35	1519	1519	-	1696	1519	-	-	-	-	-	6252	2584.6	413.38
35-36	-	-	1731	13388	3391	9820	-	-	-	-	28330	12095.6	426.95
36-37	-	-	-	13670	24091	459	-	-	-	-	38220	16994.7	444.65
37-38	-	-	-	11339	25502	33788	11197	212	-	-	82039	39783.7	484.94
38-39	-	-	-	-	18616	14730	5510	283	-	-	39139	19872.6	507.74
39-40	-	-	-	-	529	16144	6747	2367	-	-	25787	13525.5	524.52
40-41	-	-	-	-	-	-	2844	12151	106	-	15101	8938.9	591.96
41-42	-	-	-	-	36	-	159	53	1519	1519	3285	1917.9	583.85
42-43	-	-	-	-	-	-	-	-	-	1766	1766	1050.4	594.74
43-44	-	-	-	-	-	-	-	-	106	-	106	76.2	720.00
44-45	-	-	-	-	-	-	1519	53	-	-	1572	1192.5	758.69
TSN(1000)	1519	3091	2578	40093	73685	74941	27976	15118	1731	3285	244017	-	-
TSB(1000 kg)	555.9	1182.0	906.3	18230.7	35016.2	36844.4	14325.1	8890.0	1093.9	1850.8	-	118895.3	-
Mean length (cm)	34.00	33.47	34.34	35.86	36.79	37.36	38.39	39.78	41.06	41.54	-	-	-
Mean weight (g)	366.00	382.43	351.51	454.71	475.22	491.64	512.06	588.04	632.13	563.42	-	-	487.24

Variable: Abundance

EstLayer: 1

Stratum: 204

SpecCat: MAKRELL

LenGrp	age 4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
32-33	1285	-	-	-	-	-	-	-	-	1285	429.2	334.00
33-34	1794	-	-	-	-	-	-	-	-	1794	644.5	359.22
34-35	9120	-	-	-	-	-	-	-	-	9120	3430.4	376.15
35-36	-	6197	7578	32062	1153	7061	-	-	-	54051	22215.6	411.01
36-37	18328	-	16609	14387	10907	3855	1153	-	-	65239	28779.7	441.14
37-38	-	-	15641	17824	59867	12138	-	-	-	105470	49357.1	467.97
38-39	-	-	-	16595	20032	11638	10892	-	-	59158	29814.5	503.98
39-40	-	-	-	7101	15210	5767	5515	-	-	33592	17978.1	535.19
40-41	-	-	-	-	-	5434	6043	3348	2066	16892	9641.9	570.81
41-42	-	-	-	-	1794	2820	5434	-	-	10048	6087.2	605.82
42-43	-	-	-	529	-	-	-	-	384	913	561.8	615.35
44-45	-	-	-	-	-	-	-	3224	-	3224	2552.9	791.96
TSN(1000)	30527	6197	39828	88498	108963	48713	29037	6572	2450	360786	-	-
TSB(1000 kg)	12736.3	2469.5	17531.1	40114.4	52357.2	24242.7	16287.2	4381.7	1372.7	-	171492.8	-
Mean length (cm)	35.06	35.00	36.20	36.49	37.41	37.67	39.09	41.96	40.31	-	-	-
Mean weight (g)	417.21	398.48	440.17	453.28	480.50	497.66	560.92	666.72	560.27	-	-	475.33

Variable: Abundance

EstLayer: 1

Stratum: 205

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
34-35	92	92	46	-	-	-	-	-	-	231	91.5	395.60
35-36	-	185	92	231	-	-	-	-	-	509	200.2	393.45
36-37	-	-	370	-	555	-	-	-	-	925	410.6	443.90
37-38	-	-	-	231	774	-	-	-	-	1005	457.9	455.65
38-39	-	-	-	504	-	-	-	-	-	504	242.1	480.74
39-40	-	-	-	-	-	327	92	139	-	558	293.7	526.03

40-41	-	-	-	46	-	46	46	-	-	139	80.8	582.33
41-42	-	-	-	-	-	92	96	-	46	235	126.4	538.90
42-43	-	-	-	-	-	-	-	46	139	185	113.7	614.75
TSN(1000)	92	277	509	1012	1329	466	235	185	185	4290	-	-
TSB(1000 kg)	38.7	111.2	219.8	460.7	598.1	249.5	124.0	102.9	111.9	-	2016.8	-
Mean length (cm)	34.00	34.67	35.64	37.18	36.58	39.50	40.01	39.75	41.75	-	-	-
Mean weight (g)	418.50	400.67	432.00	455.11	450.13	535.66	528.84	556.50	604.75	-	-	470.12

Variable: Abundance

EstLayer: 1

Stratum: 222

SpecCat: MAKRELL

LenGrp	age 5	7	8	10	Number (1E3)	Biomass (1E3kg)	Mean W (g)
37-38	-	49	99	-	148	74.4	501.33
38-39	47	-	-	49	96	46.1	479.57
39-40	-	49	-	-	49	31.0	626.00
TSN(1000)	47	99	99	49	294	-	-
TSB(1000 kg)	22.3	55.1	50.3	23.9	-	151.5	-
Mean length (cm)	38.00	38.00	37.00	38.00	-	-	-
Mean weight (g)	477.00	557.00	508.00	482.00	-	-	515.19

IESSNS 2015. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 1

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	2313	-	-	-	-	-	-	-	-	-	-	-	-	2313	170.3	73.63
21-22	43054	-	-	-	-	-	-	-	-	-	-	-	-	43054	3440.7	79.92
22-23	147603	-	-	-	-	-	-	-	-	-	-	-	-	147603	13405.1	90.82

23-24	209022	-	-	-	-	-	-	-	-	-	-	-	-	209022	21218.6	101.51
24-25	145615	-	-	-	-	-	-	-	-	-	-	-	-	145615	16656.3	114.39
25-26	105915	-	-	-	-	-	-	-	-	-	-	-	-	105915	14139.4	133.50
26-27	45420	30817	-	-	-	-	-	-	-	-	-	-	-	76237	11713.0	153.64
27-28	10288	2235	-	-	-	-	-	-	-	-	-	-	-	12523	2047.8	163.52
28-29	10960	12160	-	-	-	-	-	-	-	-	-	-	-	23121	4628.0	200.17
29-30	-	45909	19617	-	-	-	-	-	-	-	-	-	-	65527	15236.8	232.53
30-31	-	170127	28271	-	-	-	-	-	-	-	-	-	-	198398	51292.8	258.53
31-32	-	185491	198145	233266	15454	-	-	-	-	-	-	-	-	632356	179158.7	283.32
32-33	-	116500	318915	569913	91230	-	-	-	-	5304	-	-	-	1101861	329461.3	299.00
33-34	-	21250	144653	569945	415798	12412	-	-	316	-	-	-	-	1164374	374062.2	321.26
34-35	-	-	38550	318764	231842	21029	331	-	-	-	-	-	-	610517	210760.3	345.22
35-36	-	-	43027	32123	121266	35254	19965	45556	-	929	-	-	-	298121	109239.0	366.43
36-37	-	-	-	25251	19201	37931	36104	46388	21481	8787	-	-	-	195144	78393.3	401.72
37-38	-	-	-	-	4670	18225	86196	51858	35841	3526	1103	2995	-	204414	87087.9	426.04
38-39	-	-	-	-	-	9504	35330	28517	9311	23591	4768	-	-	111021	51154.2	460.76
39-40	-	-	-	-	-	-	9387	16432	14989	6398	4332	6127	2807	60471	30058.1	497.07
40-41	-	-	-	-	-	-	529	3971	11196	2004	-	-	1416	19117	10197.3	533.42
41-42	-	-	-	-	-	-	-	4831	216	-	6615	-	-	11662	6334.9	543.22
42-43	-	-	-	-	-	-	-	-	-	4574	-	3325	-	7899	4435.3	561.52
43-44	-	-	-	-	1232	-	-	-	831	-	-	-	271	2334	1658.3	710.36
44-45	-	-	-	-	-	-	-	-	-	-	213	-	-	213	124.8	586.00
TSN(1000)	720190	584489	791177	1749263	900693	134357	187841	197553	94181	55113	17031	12447	4495	5448829	-	-
TSB(1000 kg)	79551.0	156504.1	235838.1	551273.9	301991.8	52238.6	80958.9	85222.1	40940.8	24753.3	8485.8	6001.9	2314.5	-	1626074.6	-
Mean length (cm)	23.66	30.65	32.19	32.82	33.58	35.52	36.97	36.88	37.76	37.61	39.49	39.45	39.76	-	-	-
Mean weight (g)	110.46	267.76	298.09	315.15	335.29	388.81	431.00	431.39	434.70	449.14	498.26	482.21	514.94	-	-	298.43

Variable: Abundance

EstLayer: 1

Stratum: 2

SpecCat: MAKRELL

	age														
LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	53	-	-	-	-	-	-	-	-	-	-	-	53	12.9	242.00
29-30	-	8762	-	-	-	-	-	-	-	-	-	-	8762	2249.6	256.75
30-31	-	41063	15741	-	-	-	-	-	-	-	-	-	56804	14666.7	258.20
31-32	12281	43328	48649	6967	-	-	-	-	-	-	-	-	111225	31580.8	283.94
32-33	10396	63110	159802	15489	2252	-	-	-	-	-	-	-	251050	76309.3	303.96
33-34	-	41579	226219	134857	665	12425	-	-	-	-	-	-	415745	139663.3	335.94
34-35	-	-	47504	169733	55014	62538	-	-	-	-	-	-	334789	123524.1	368.96
35-36	-	-	3776	114558	84948	23178	297	3474	-	-	-	-	230231	92388.5	401.29
36-37	-	-	4937	24658	62744	84150	26936	3646	11176	-	-	-	218246	94891.8	434.79
37-38	-	-	-	699	46622	47662	58232	11928	215	-	-	-	165359	78056.5	472.04
38-39	-	-	-	-	-	11058	62723	23611	-	-	-	-	97392	49707.9	510.39
39-40	-	-	-	-	535	1898	10899	9305	5941	6028	-	-	34605	17902.7	517.34
40-41	-	-	-	-	-	5320	6802	-	298	-	-	646	13066	6849.1	524.17
41-42	-	-	-	-	-	-	-	1369	1233	1813	2350	-	6765	3875.0	572.80
42-43	-	-	-	-	-	-	-	163	-	528	2090	-	2781	1842.1	662.36
43-44	-	-	-	-	-	-	-	-	-	-	-	635	635	437.3	688.85
44-45	-	-	-	-	-	-	-	-	163	215	-	-	378	271.0	716.58
TSN(1000)	22729	197843	506627	466962	252780	248229	165889	53495	19026	8584	4440	1281	1947886	-	-
TSB(1000 kg)	6443.7	57663.2	164365.3	170114.4	104582.7	104972.8	81964.1	26704.4	9431.9	4451.4	2763.2	771.3	-	734228.4	-
Mean length (cm)	31.45	31.44	32.54	33.96	35.38	35.64	37.47	37.71	37.40	39.73	41.47	41.49	-	-	-
Mean weight (g)	283.49	291.46	324.43	364.30	413.73	422.89	494.09	499.20	495.73	518.55	622.37	602.17	-	-	376.94

Variable: Abundance

EstLayer: 1

Stratum: 3

SpecCat: MAKRELL

	age												
LenGrp	2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-

29-30	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	-	1654	-	-	-	-	-	-	-	-	1654	417.0	252.20
31-32	3839	8103	4317	-	-	-	-	-	-	-	16260	4664.9	286.90
32-33	4908	7977	28571	5674	-	-	-	-	-	-	47130	14004.2	297.14
33-34	9070	50208	42795	17066	257	-	-	-	-	-	119396	40414.6	338.49
34-35	-	69696	68222	39745	-	-	-	-	-	-	177663	64307.0	361.96
35-36	2336	1975	48662	78201	34090	4872	268	-	-	-	170404	68296.1	400.79
36-37	-	12093	30127	45252	64990	18221	10340	-	-	-	181022	78768.6	435.13
37-38	-	9449	19508	32965	39786	53800	10128	-	-	-	165636	76700.3	463.06
38-39	-	1733	3572	31666	47568	15572	18026	10676	-	-	128812	64610.3	501.59
39-40	-	-	14226	7972	25239	4849	10738	164	1292	329	64808	35100.5	541.61
40-41	-	-	857	4205	2814	4095	3419	164	904	-	16458	9407.6	571.63
41-42	-	-	-	1924	955	3801	415	164	425	3542	11224	6896.2	614.41
42-43	-	-	-	1032	2854	-	-	329	-	-	4215	2892.7	686.33
43-44	-	-	-	294	-	-	-	-	-	-	294	204.6	696.79
44-45	-	-	-	-	-	-	955	-	-	-	955	637.1	667.28
45-46	-	-	-	45	-	-	-	-	-	-	45	33.6	753.05
46-47	-	-	-	-	-	45	-	-	-	-	45	34.4	770.35
TSN(1000)	20154	162887	260858	266039	218552	105254	54288	11495	2621	3870	1106018	-	-
TSB(1000 kg)	6397.8	58187.3	101540.9	112862.9	101926.2	49629.7	27049.3	5864.4	1429.2	2501.9	-	467389.7	-
Mean length (cm)	32.61	33.78	34.56	35.71	36.96	37.24	37.87	38.20	39.67	40.83	-	-	-
Mean weight (g)	317.45	357.22	389.26	424.23	466.37	471.52	498.25	510.16	545.39	646.41	-	-	422.59

Variable: Abundance

EstLayer: 1

Stratum: 4

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-

30-31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31-32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32-33	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33-34	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34-35	-	-	369	554	-	-	-	-	-	-	-	923	346.1	374.78
35-36	185	-	185	923	-	-	-	-	-	-	-	1293	516.4	399.43
36-37	-	369	1108	739	1478	554	369	-	-	-	-	4617	1946.5	421.56
37-38	-	185	369	1108	739	1108	2401	923	-	-	185	7018	3285.5	468.13
38-39	-	-	739	923	923	1662	1478	369	369	185	-	6649	3209.5	482.71
39-40	-	185	185	554	739	923	369	739	369	369	-	4433	2349.1	529.96
40-41	-	-	-	185	185	-	1478	185	-	-	-	2032	1152.0	567.03
41-42	-	-	-	-	185	-	-	185	-	-	-	369	218.4	591.15
42-43	-	-	-	-	-	-	185	-	-	-	-	185	126.4	684.15
43-44	-	-	-	-	-	-	-	185	-	-	-	185	131.9	713.95
44-45	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSN(1000)	185	739	2955	4987	4248	4248	6280	2586	739	554	185	27704	-	-
TSB(1000 kg)	64.4	360.4	1343.7	2252.2	2014.3	2055.3	3084.6	1348.6	375.6	296.0	86.8	-	13281.7	-
Mean length (cm)	35.00	37.00	36.50	36.67	37.52	37.70	38.15	38.64	38.50	38.67	37.00	-	-	-
Mean weight (g)	348.55	487.88	454.71	451.64	474.18	483.83	491.21	521.55	508.35	534.15	470.00	-	-	479.42

Variable: Abundance

EstLayer: 1

Stratum: 5

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-
30-31	-	-	-	-	-	-	-	-	-	-	-	-
31-32	39	-	-	-	-	-	-	-	-	39	10.0	258.85
32-33	12470	5066	-	-	-	-	-	-	-	17536	5362.3	305.79

33-34	|	26743	49011	27258	-	-	-	-	-	-	103012	34926.7	339.05
34-35	|	57876	127290	1336	-	354	-	-	-	-	186856	68094.6	364.42
35-36	|	933	34182	118984	21159	-	6979	-	-	-	182239	74285.7	407.63
36-37	|	34344	48795	86572	59440	8625	12811	534	-	-	251122	110263.4	439.08
37-38	|	-	20042	81302	67639	59333	3588	5758	-	-	237661	113653.2	478.22
38-39	|	1610	4927	70978	20142	40015	21770	21319	-	-	180760	94343.4	521.93
39-40	|	-	11928	19158	13224	29719	13336	15109	1273	-	103747	56906.1	548.51
40-41	|	-	-	7390	361	12977	6431	145	-	-	27303	15469.2	566.58
41-42	|	-	-	-	4860	5284	-	-	51	-	10195	6282.1	616.20
42-43	|	-	-	-	-	5965	5942	-	-	-	11907	7460.7	626.57
43-44	|	-	-	-	-	-	-	-	511	-	511	364.6	713.19
44-45	|	-	-	-	-	-	-	-	-	51	51	31.5	623.85
TSN(1000)	|	134016	301243	412979	186825	162271	70856	42864	1835	51	1312939	-	-
TSB(1000 kg)	|	51054.0	118133.7	187946.1	86283.1	83970.0	35974.0	23017.5	1043.6	31.5	-	587453.6	-
Mean length (cm)	|	34.18	34.70	36.26	36.81	38.11	38.00	38.20	40.17	44.00	-	-	-
Mean weight (g)	|	380.96	392.15	455.10	461.84	517.47	507.70	536.99	568.82	623.85	-	-	447.43

Variable: Abundance

EstLayer: 1

Stratum: 6

SpecCat: MAKRELL

		age												
LenGrp		2	3	4	5	6	7	8	9	10	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	|	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	|	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	|	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	|	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	|	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	|	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	|	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	|	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	|	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	|	1063	-	-	-	-	-	-	-	-	-	1063	224.3	211.00
30-31	|	2389	-	-	-	-	-	-	-	-	-	2389	655.1	274.20
31-32	|	5270	22096	-	-	-	-	-	-	-	-	27366	7693.4	281.13
32-33	|	44343	39307	88089	50682	-	-	-	-	-	-	222422	68634.6	308.58
33-34	|	11391	307963	246390	73087	-	-	-	-	-	-	638831	212560.6	332.73
34-35	|	2747	201458	197186	238360	19855	63156	5805	-	-	-	728567	259267.6	355.86
35-36	|	30418	147296	160688	212866	56465	29822	-	-	-	-	637555	245707.0	385.39

36-37	-	23422	53525	158190	126451	58185	115496	4207	-	-	539478	226272.4	419.43
37-38	-	-	57746	191892	116826	80256	32199	50726	-	-	529645	243306.1	459.38
38-39	-	19317	6393	79876	87250	60712	10357	37999	562	-	302468	145414.6	480.76
39-40	-	959	2875	22787	43111	7718	38431	12244	-	-	128125	66126.4	516.11
40-41	-	-	-	-	11750	13032	3300	-	17677	-	45759	24988.1	546.08
41-42	-	-	-	-	1391	-	649	3007	344	-	5391	3081.8	571.63
42-43	-	-	-	-	55	-	-	-	1768	-	1823	1091.8	599.00
43-44	-	-	-	119	-	-	-	-	-	-	119	80.1	672.30
44-45	-	-	-	-	-	-	-	-	-	55	55	34.2	623.85
TSN(1000)	97622	761819	812892	1027858	463155	312882	206238	108183	20351	55	3811056	-	-
TSB(1000 kg)	32635.8	264117.8	298981.1	409595.3	206088.4	139875.4	91588.9	51109.0	11112.1	34.2	-	1505138.2	-
Mean length (cm)	32.97	33.77	34.07	35.33	36.82	36.39	36.84	37.65	40.14	44.00	-	-	-
Mean weight (g)	334.31	346.69	367.80	398.49	444.97	447.05	444.09	472.43	546.03	623.85	-	-	394.94

Variable: Abundance

EstLayer: 1

Stratum: 7

SpecCat: MAKRELL

LenGrp (age)	1	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	6678	-	-	-	-	-	-	-	-	-	-	-	-	6678	961.6	144.00
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	-	-	76963	31044	-	-	-	-	-	-	-	-	-	108007	30578.7	283.12
31-32	-	5244	78867	379121	71380	-	-	-	-	-	-	-	-	534612	158988.7	297.39
32-33	-	28718	126305	1049219	202961	20252	-	-	-	-	-	-	-	1427454	455316.6	318.97
33-34	-	-	107111	740935	456657	76461	-	-	-	-	-	-	-	1381165	470594.9	340.72
34-35	-	-	30693	171394	414404	108129	34166	-	-	-	-	-	-	758785	277133.3	365.23
35-36	-	-	-	5880	137486	90025	55905	52245	-	-	-	-	-	341541	135930.1	397.99
36-37	-	-	-	-	73056	6899	60635	115554	41824	-	-	-	-	297968	132527.8	444.77
37-38	-	-	-	-	-	59086	61771	133421	65947	44037	-	-	-	364261	171832.2	471.73
38-39	-	-	-	-	-	8697	24905	48491	71997	23227	21240	-	-	198558	101120.2	509.27

39-40	-	-	-	-	-	-	15871	17333	9741	4099	-	24985	-	72028	37919.7	526.46
40-41	-	-	-	-	-	7638	-	-	4226	-	-	8071	-	19934	10838.7	543.73
41-42	-	-	-	-	-	-	-	-	-	4735	-	-	-	4735	2751.9	581.18
42-43	-	-	-	-	-	-	-	-	-	-	9018	-	-	9018	5960.9	660.98
43-44	-	-	-	-	-	-	-	-	-	-	-	-	1415	1415	974.6	688.51
44-45	-	-	-	-	-	-	-	-	-	143	-	-	-	143	82.9	580.00
TSN(1000)	6678	33962	419940	2377592	1355943	377187	253253	367045	193734	76241	30258	33055	1415	5526303	-	-
TSB(1000 kg)	961.6	10790.8	132519.5	771425.6	480504.6	147749.0	109438.8	171046.9	95591.8	38761.0	16375.6	17373.0	974.6	-	1993512.8	-
Mean length (cm)	25.00	32.05	32.11	32.54	33.65	34.85	36.29	36.85	37.54	37.89	39.41	39.28	43.11	-	-	-
Mean weight (g)	144.00	317.73	315.57	324.46	354.37	391.71	432.13	466.01	493.42	508.40	541.19	525.58	688.51	-	-	360.73

Variable: Abundance

EstLayer: 1

Stratum: 8

SpecCat: MAKRELL

	age														
LenGrp	1	2	3	4	5	6	7	8	9	10	11	12	13	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	539	-	-	-	-	-	-	-	-	-	-	-	-	539	49.2	91.25
22-23	12072	-	-	-	-	-	-	-	-	-	-	-	-	12072	1062.5	88.01
23-24	42791	-	-	-	-	-	-	-	-	-	-	-	-	42791	4268.8	99.76
24-25	37722	-	-	-	-	-	-	-	-	-	-	-	-	37722	4129.9	109.48
25-26	24675	-	-	-	-	-	-	-	-	-	-	-	-	24675	2932.7	118.86
26-27	9373	-	-	-	-	-	-	-	-	-	-	-	-	9373	1257.5	134.16
27-28	1720	-	-	-	-	-	-	-	-	-	-	-	-	1720	256.1	148.90
28-29	2516	-	-	-	-	-	-	-	-	-	-	-	-	2516	440.6	175.14
29-30	-	183	-	-	-	-	-	-	-	-	-	-	-	183	38.1	208.00
30-31	-	-	1934	-	-	-	-	-	-	-	-	-	-	1934	407.1	210.46
31-32	-	7302	814	-	-	-	-	-	-	-	-	-	-	8116	1964.9	242.11
32-33	-	3654	167	24312	2396	-	-	-	-	-	-	-	-	30528	8277.8	271.15
33-34	-	928	15024	34369	10032	29	-	-	-	-	-	-	-	60382	17276.8	286.12
34-35	-	-	3488	16140	14110	836	-	-	555	-	-	-	-	35128	11379.4	323.94
35-36	-	-	-	1946	21181	739	1495	-	-	-	-	-	-	25361	8861.3	349.41
36-37	-	-	-	39	3469	2023	3871	6483	41	-	-	-	-	15925	6041.1	379.34
37-38	-	-	-	-	-	232	2169	21845	439	4477	-	-	-	29163	11958.1	410.05
38-39	-	-	-	-	282	2164	690	4860	4983	10624	-	-	-	23603	10615.5	449.76
39-40	-	-	-	-	-	1991	158	2621	368	1107	654	-	-	6899	3345.5	484.93
40-41	-	-	-	-	-	-	173	495	261	1560	141	8	-	2639	1401.9	531.25
41-42	-	-	-	-	-	-	-	-	-	253	115	244	708	1320	715.5	542.06

42-43	-	-	-	-	-	-	-	-	-	884	-	-	-	884	597.4	675.68
43-44	-	-	-	-	-	-	-	-	-	-	-	-	8	8	5.9	733.00
44-45	-	-	-	-	-	-	-	-	33	-	-	-	-	33	20.4	622.00
TSN(1000)	131407	12066	21428	76805	51469	8014	8556	36304	6679	18905	911	252	716	373513	-	-
TSB(1000 kg)	14397.3	3146.5	6065.8	22355.8	16853.1	3586.0	3534.3	14640.8	3104.2	8610.9	492.5	128.0	388.8	-	97303.8	-
Mean length (cm)	24.12	31.59	32.94	33.06	34.43	37.18	36.50	37.25	37.97	38.34	39.69	41.42	41.49	-	-	-
Mean weight (g)	109.56	260.78	283.08	291.07	327.44	447.44	413.08	403.28	464.77	455.48	540.79	507.58	542.86	-	-	260.51

Variable: Abundance

EstLayer: 1

Stratum: 9

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	3331	-	-	-	-	-	-	-	-	-	-	-	3331	799.5	240.00
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	-	5632	3331	-	-	-	-	-	-	-	-	-	8963	2693.9	300.54
31-32	-	39296	-	42445	-	-	-	-	-	-	-	-	81742	25076.4	306.78
32-33	-	24965	26651	109550	18415	-	-	-	-	-	-	-	179580	58567.2	326.13
33-34	-	-	-	69010	75166	-	-	-	-	-	-	-	144177	50233.2	348.41
34-35	-	-	-	56334	82933	-	552	-	-	-	-	-	139819	51055.6	365.15
35-36	-	-	-	-	9237	29062	8550	31047	-	-	-	-	77897	31035.9	398.42
36-37	-	-	-	-	13464	10989	12126	10383	71992	4972	-	-	123928	54237.8	437.66
37-38	-	-	-	-	-	18420	126645	9647	50528	4754	931	-	210926	97537.3	462.42
38-39	-	-	-	-	-	3478	25455	-	26609	34548	-	-	90090	45501.7	505.07
39-40	-	-	-	-	-	-	4341	7684	29916	3507	-	-	45448	25370.9	558.23
40-41	-	-	-	-	-	-	-	-	-	24786	-	4876	29661	16277.6	548.78
41-42	-	-	-	-	-	-	-	-	2165	-	6596	5871	14632	9042.9	618.01
42-43	-	-	-	-	-	-	-	-	-	-	2468	-	2468	1887.5	764.79
43-44	-	-	-	-	-	-	-	-	85	-	-	-	85	54.8	645.00
44-45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TSN(1000)	3331	69893	29983	277339	199216	61950	177669	58761	181296	72568	9995	10747	1152748	-	-
TSB(1000 kg)	799.5	22031.2	9164.7	92930.0	72971.2	26767.4	82865.1	26018.9	85906.1	37058.9	6422.0	6437.2	-	469372.2	-
Mean length (cm)	28.00	31.64	32.06	32.75	33.86	36.09	37.23	36.29	37.29	38.81	41.06	40.62	-	-	-
Mean weight (g)	240.00	315.21	305.67	335.08	366.29	432.08	466.40	442.79	473.84	510.68	642.54	598.98	-	-	407.18

Variable: Abundance

EstLayer: 1

Stratum: 10

SpecCat: MAKRELL

LenGrp	age 3	4	5	6	7	8	9	10	11	12	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	-	-	-	-	-	-	-	-	-	-	-	-	-
31-32	-	-	-	-	-	-	-	-	-	-	-	-	-
32-33	-	-	258	-	-	-	-	-	-	-	258	78.3	303.40
33-34	-	3867	-	-	-	-	-	-	-	-	3867	1360.6	351.80
34-35	4304	5275	-	-	-	-	-	-	-	-	9579	3314.2	345.99
35-36	1874	2993	452	-	1796	-	-	-	-	-	7115	2873.5	403.87
36-37	-	1726	7957	22575	4590	-	-	-	-	-	36848	17635.1	478.59
37-38	-	3209	20290	31990	36347	1940	1716	-	-	-	95492	48473.0	507.61
38-39	13953	658	57095	6993	44387	25095	3713	-	-	-	151895	84533.4	556.52
39-40	-	13497	13399	19716	36640	39569	16522	-	861	-	140203	81922.5	584.31
40-41	-	-	14958	7031	11432	23754	9969	429	-	-	67572	39948.0	591.19
41-42	-	12523	-	191	17715	1287	885	287	346	-	33234	21824.6	656.70
42-43	-	-	-	-	15761	-	-	-	-	-	15761	10328.8	655.32
43-44	-	-	-	-	-	-	373	2449	-	-	2822	1938.8	687.14
44-45	-	-	-	-	-	-	-	-	-	3488	3488	2176.2	623.85
45-46	-	-	1744	-	-	-	-	-	-	-	1744	1476.4	846.45
TSN(1000)	20132	43750	116153	88496	168669	91644	33178	3164	1207	3488	569880	-	-

TSB(1000 kg)	10427.7	22956.2	63684.1	47576.6	96560.7	52585.1	19120.1	2150.4	646.2	2176.2	-	317883.4	-
Mean length (cm)	36.87	37.89	38.14	37.52	38.74	38.97	39.18	42.41	39.57	44.00	-	-	-
Mean weight (g)	517.97	524.72	548.28	537.61	572.49	573.80	576.29	679.66	535.53	623.85	-	-	557.81

IESSNS 2016. Estimates of abundance, mean weight and mean length by stratum of mackerel.

Variable: Abundance

EstLayer: 1

Stratum: 1

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Unknown	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	239	239	17.4	73.00
21-22	606	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	606	44.2	72.91
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1801	1801	144.7	80.34
23-24	1364	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1364	144.7	106.11
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	156	156	20.0	128.00
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	31445	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31445	5283.4	168.02
27-28	-	283501	-	5064	-	-	-	-	-	-	-	-	-	-	-	-	288564	52717.4	182.69
28-29	-	809522	22035	-	3675	-	-	-	-	-	-	-	-	-	-	-	835231	166824.2	199.73
29-30	-	1297065	38832	-	-	-	-	-	-	-	-	-	-	-	-	-	1335897	294911.6	220.76
30-31	-	938739	20388	-	564	-	-	-	-	-	-	-	-	-	-	-	959691	231011.9	240.71
31-32	-	220968	92367	-	20037	647	-	-	-	-	-	-	-	-	-	-	334019	90290.3	270.32
32-33	-	47888	114827	29638	62274	6206	1364	-	-	-	-	-	-	-	-	-	262197	79442.3	302.99
33-34	-	16537	88514	180406	238022	43809	682	3499	-	-	564	-	-	-	-	-	572033	188543.8	329.60
34-35	-	2522	84694	183075	295105	143639	6512	13787	3704	641	-	-	-	-	-	-	733680	256657.3	349.82
35-36	-	1520	16814	72590	131937	206045	16622	9428	3623	-	1053	-	-	-	-	-	459631	171784.7	373.74
36-37	-	-	2515	23863	39868	65389	29702	30843	11392	9328	1572	123	-	-	-	-	214594	86440.7	402.81
37-38	-	-	-	-	-	15428	44807	26768	12031	10160	14473	-	7591	-	-	-	131259	55414.5	422.18
38-39	-	-	-	-	-	6253	23603	19986	11329	12363	3422	6866	-	-	-	-	83822	37241.6	444.29
39-40	-	-	-	-	-	-	4580	5894	2866	6605	11413	1394	-	-	1736	-	34488	16155.2	468.44
40-41	-	-	-	-	-	640	-	864	-	2687	3749	2405	-	3690	2496	-	16532	8336.6	504.28
41-42	-	-	-	-	-	-	-	790	1491	2264	-	725	-	-	-	-	5269	2822.1	535.59
42-43	-	-	-	-	-	-	-	-	-	613	-	1606	1033	-	-	-	3252	2011.8	618.55
43-44	-	-	-	-	-	-	-	-	-	-	277	-	-	-	-	-	277	173.6	626.00
TSN(1000)	1970	3649705	480986	494636	791481	488056	127873	111860	46436	44662	36523	13119	8625	3690	4232	2196	6306048	-	-
TSB(1000 kg)	188.9	810633.6	144904.8	172190.3	271790.7	178811.5	52700.5	46224.5	19351.5	19120.5	16059.1	6501.9	3724.2	1959.4	2090.4	182.1	-	1746434.0	-
Mean length (cm)	22.67	29.21	32.13	33.81	33.89	34.88	36.64	36.50	37.07	37.90	38.04	39.14	37.72	40.14	39.72	22.03	-	-	-
Mean weight (g)	95.89	222.11	301.27	348.11	343.40	366.38	412.13	413.24	416.74	428.12	439.70	495.62	431.79	531.06	493.91	82.92	-	-	276.95

Variable: Abundance

EstLayer: 1

Stratum: 2

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	1063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1063	199.9	188.00
27-28	13876	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13876	2852.2	205.55
28-29	103221	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103221	22298.0	216.02
29-30	218681	5106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	223786	52210.9	233.31
30-31	118370	64736	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	183106	46744.6	255.29
31-32	67365	9773	3546	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80684	22862.9	283.36
32-33	17733	75749	57613	10556	9549	-	-	-	-	-	-	-	-	-	-	-	-	171200	54041.8	315.66
33-34	3861	92261	138227	166794	16703	2818	629	-	-	-	-	-	-	-	-	-	-	421294	142297.8	337.76
34-35	-	13772	73144	238003	138124	34078	29998	-	-	-	-	-	-	-	-	-	-	527119	191327.1	362.97
35-36	-	15376	29338	45364	87714	67544	13596	5765	10569	-	1219	-	-	-	-	-	-	276485	107138.6	387.50
36-37	-	-	1272	14021	65195	23347	28896	8704	15303	891	-	-	-	-	-	-	-	157628	66155.1	419.69
37-38	-	-	-	4242	1310	18017	42535	21394	8630	2647	-	4901	-	578	-	-	-	104254	46817.6	449.07
38-39	-	-	-	440	-	1645	11869	12098	27533	11213	15773	1672	-	-	-	-	-	82242	39031.7	474.59
39-40	-	-	-	-	-	-	-	12184	9588	-	12955	648	3267	-	-	-	-	38642	19914.7	515.36
40-41	-	-	-	-	-	-	3037	-	1610	2880	4654	-	177	-	-	-	-	12358	6521.6	527.72
41-42	-	-	-	-	-	-	-	209	39	1257	2152	-	-	-	-	-	-	3657	2069.5	565.94
42-43	-	-	-	-	-	-	-	-	-	-	-	-	851	-	-	-	-	851	525.1	616.78
43-44	-	-	-	-	-	-	-	-	-	-	245	-	-	-	-	343	-	588	371.4	631.20
44-45	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-	-	349	388	284.1	732.58
45-46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	-	-	102	87.5	855.00
TSN(1000)	544171	276774	303139	479419	318595	147449	130560	60354	73272	18888	36998	7221	4334	578	102	343	349	2402545	-	-
TSB(1000 kg)	132176.9	86667.2	104984.9	171548.8	120628.3	57129.7	55854.2	28079.3	32749.5	9438.7	18017.2	3298.6	2349.7	270.3	87.5	214.3	257.2	-	823752.2	-
Mean length (cm)	29.35	32.04	33.24	33.80	34.59	35.19	36.05	37.30	37.22	38.28	38.73	37.44	39.72	37.00	45.00	43.00	44.00	-	-	-
Mean weight (g)	242.90	313.13	346.33	357.83	378.63	387.45	427.81	465.24	446.96	499.73	486.97	456.83	542.12	468.00	855.00	624.00	737.00	-	-	342.87

Variable: Abundance

EstLayer: 1

Stratum: 3

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	11	12	13	14	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	11657	-	-	-	-	-	-	-	-	-	-	-	-	11657	2984.5	256.02
31-32	13508	2723	-	-	872	-	-	-	-	-	-	-	-	17103	4816.9	281.64
32-33	2601	1827	-	31653	12679	-	-	-	-	-	-	-	-	48760	15156.6	310.84
33-34	32509	16109	18600	43237	-	24353	-	952	-	-	-	-	-	135760	45280.2	333.53
34-35	-	4673	74760	139074	68380	-	-	2090	-	-	-	-	-	288978	104691.2	362.28
35-36	-	-	12687	91589	71922	14721	15855	-	2585	-	-	-	-	209359	80987.2	386.83
36-37	-	2499	2225	8761	67578	31542	29909	8909	6249	-	-	-	-	157672	66975.9	424.78
37-38	-	-	1243	21481	11798	24587	30927	18155	26601	6263	-	-	-	141054	64240.7	455.43
38-39	-	38	-	39	21549	40186	21939	39168	11532	-	2555	-	-	137007	66719.5	486.98
39-40	-	-	-	1631	3332	9406	21583	13994	7107	-	9329	-	-	66382	35800.6	539.31
40-41	-	-	-	-	-	558	2549	2561	11519	7024	-	1212	-	25423	13028.1	512.46
41-42	-	-	-	-	-	-	-	6001	9297	2184	-	-	418	17899	10399.9	581.03
42-43	-	-	-	-	-	-	-	332	2723	-	2815	-	-	5870	3513.0	598.42
43-44	-	-	-	-	-	-	-	516	516	-	504	38	-	1574	1030.4	654.49
TSN(1000)	60276	27869	109515	337466	258110	145353	122761	92678	78128	15471	15204	1250	418	1264500	-	-
TSB(1000 kg)	18107.4	9468.7	39459.0	123812.0	103077.4	64723.6	56783.5	45667.1	38322.8	7436.8	7774.2	732.8	259.2	-	515624.7	-
Mean length (cm)	31.93	33.18	34.02	34.22	35.23	36.33	37.09	37.91	38.32	38.93	39.52	40.09	41.00	-	-	-
Mean weight (g)	300.41	339.76	360.31	366.89	399.35	445.28	462.56	492.75	490.51	480.70	511.33	586.37	620.00	-	-	407.77

Variable: Abundance

EstLayer: 1

Stratum: 4

SpecCat: MAKRELL

LenGrp (age)	2	3	4	5	6	7	8	9	10	11	Number (1E3)	Biomass (1E3kg)	Mean W (g)

20-21	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	2058	-	-	-	-	-	-	-	-	-	2058	434.2	211.00
31-32	-	-	-	-	-	-	-	-	-	-	-	-	-
32-33	-	2058	4116	-	-	-	-	-	-	-	6174	1922.2	311.33
33-34	6174	-	6174	16464	-	-	-	-	-	-	28813	9312.9	323.22
34-35	-	-	39103	18522	22639	-	-	-	-	-	80264	28454.4	354.51
35-36	10290	-	-	12348	49393	8232	8232	-	-	-	88496	33165.1	374.76
36-37	-	-	6174	10290	41161	14406	-	-	-	-	72032	28619.9	397.32
37-38	-	-	-	10290	-	29	8232	-	-	-	18551	8520.0	459.27
38-39	-	-	-	4116	-	-	-	4182	-	-	8298	3992.6	481.15
39-40	-	-	-	-	-	-	4153	-	-	-	4153	2269.1	546.36
40-41	-	-	-	-	-	-	66	-	37	-	103	51.9	504.62
41-42	-	-	-	-	-	37	-	-	-	37	74	41.7	561.80
42-43	-	-	-	-	-	-	-	37	-	-	37	20.5	552.60
43-44	-	-	-	-	-	-	-	-	37	-	37	22.7	612.00
44-45	-	-	-	-	-	-	-	-	-	37	37	21.5	578.80
TSN(1000)	18522	2058	55567	72032	113193	22704	20683	4219	74	74	309127	-	-
TSB(1000 kg)	6647.9	623.6	19769.8	27002.0	42556.8	9012.0	9214.0	1939.0	42.1	41.4	-	116848.6	-
Mean length (cm)	33.78	32.00	33.96	34.89	35.16	35.65	36.62	38.04	41.50	42.50	-	-	-
Mean weight (g)	358.91	303.00	355.78	374.86	375.97	396.93	445.48	459.58	567.90	558.00	-	-	377.99

Variable: Abundance

EstLayer: 1

Stratum: 5

SpecCat: MAKRELL

	age														
LenGrp	2	3	4	5	6	7	8	9	10	11	13	14	Number	Biomass	Mean W
													(1E3)	(1E3kg)	(g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

24-25	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31-32	|	1574	-	-	-	-	-	-	-	-	-	-	-	1574	429.6	273.00
32-33	|	28165	-	39331	-	-	-	-	-	-	-	-	-	67496	20582.5	304.95
33-34	|	11742	55801	96805	101159	1071	-	-	-	-	-	-	-	266578	93143.3	349.40
34-35	|	-	46604	400256	130315	215419	2644	469	235	-	-	-	-	795941	291469.3	366.19
35-36	|	-	18868	156040	401025	332743	1414	-	-	-	-	-	-	910090	351049.3	385.73
36-37	|	-	-	54721	166715	233826	155811	75170	658	383	-	-	-	687283	290165.7	422.19
37-38	|	-	-	293	53225	75866	106010	158480	105601	39460	299	-	-	539235	245260.1	454.83
38-39	|	-	-	-	59	81475	59870	149004	46965	32	6325	-	-	343730	166494.5	484.38
39-40	|	-	-	-	-	-	15476	52848	66048	2232	1898	33	-	138535	70407.6	508.23
40-41	|	-	-	-	-	21	157	1957	3571	1574	1268	-	-	8547	4722.8	552.55
41-42	|	-	-	-	-	-	-	-	-	3147	32	-	-	3179	1997.3	628.27
42-43	|	-	-	-	-	-	-	-	-	-	-	-	5637	5637	3337.2	592.00
43-44	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSN(1000)	|	41480	121274	747446	852497	940421	341381	437927	223078	46827	9823	33	5637	3767824	-	-
TSB(1000 kg)	|	12860.8	43422.8	270442.6	331602.9	383140.0	153651.7	204122.0	107632.1	24217.2	4613.7	16.2	3337.2	-	1539059.1	-
Mean length (cm)	|	32.25	33.70	34.12	34.93	35.44	36.78	37.42	37.84	37.46	38.43	39.00	42.00	-	-	-
Mean weight (g)	|	310.05	358.06	361.82	388.98	407.41	450.09	466.11	482.49	517.17	469.71	486.60	592.00	-	-	408.47

Variable: Abundance

EstLayer: 1

Stratum: 6

SpecCat: MAKRELL

LenGrp	age	2	3	4	5	6	7	8	9	10	11	13	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	|	73	-	-	-	-	-	-	-	-	-	-	-	73	11.0	152.00
28-29	|	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	|	2148	-	-	-	-	-	-	-	-	-	-	-	2148	412.3	192.00

30-31	2940	-	-	-	-	-	-	-	-	-	-	-	2940	727.9	247.63
31-32	5776	-	-	-	-	-	-	-	-	-	-	-	5776	1558.7	269.85
32-33	2196	19151	26331	13195	-	241	-	-	-	-	-	-	61115	18748.3	306.77
33-34	-	27473	115488	52447	24274	-	608	-	-	-	-	-	220291	73372.7	333.07
34-35	22039	38177	105251	116693	81575	8806	-	-	-	-	-	-	372541	134374.8	360.70
35-36	34709	12754	111572	56590	75391	5171	13446	-	-	-	-	-	309635	119673.5	386.50
36-37	-	9236	31019	21788	15610	14445	55273	12385	166	-	-	-	159922	67352.2	421.16
37-38	-	-	4209	1303	17119	78077	12651	14021	-	-	-	-	127380	57567.9	451.94
38-39	-	-	-	8322	26324	26108	14718	5656	274	877	-	-	82278	39426.1	479.18
39-40	-	-	-	1833	-	7890	1734	4321	8075	-	-	-	23853	12036.9	504.62
40-41	-	-	-	-	-	-	2801	635	2349	170	-	-	5955	3330.7	559.28
41-42	-	-	-	-	-	-	-	-	5358	-	-	-	5358	3286.9	613.47
42-43	-	-	-	-	-	-	-	28	-	-	550	28	607	417.7	688.18
43-44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TSN(1000)	69881	106791	393871	272171	240294	140738	101231	37046	16222	1047	550	28	1379871	-	-
TSB(1000 kg)	25279.9	37098.0	141027.3	100479.9	94882.4	62965.3	43824.2	17051.5	8783.9	503.1	383.6	18.4	-	532297.5	-
Mean length (cm)	33.86	33.68	34.05	34.25	34.99	36.93	36.43	37.11	39.76	38.32	42.00	42.00	-	-	-
Mean weight (g)	361.76	347.39	358.05	369.18	394.86	447.39	432.91	460.28	541.48	480.40	697.00	652.00	-	-	385.76

Variable: Abundance

EstLayer: 1

Stratum: 7

SpecCat: MAKRELL

	age																
LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Number	Biomass	Mean W
															(1E3)	(1E3kg)	(g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	10522	-	-	-	-	-	-	-	-	-	-	-	-	-	10522	2359.7	224.26
29-30	68876	-	-	-	-	-	-	-	-	-	-	-	-	-	68876	16567.2	240.54
30-31	131555	12816	-	-	-	-	-	-	-	-	-	-	-	-	144371	38289.5	265.22
31-32	104456	1813	-	-	-	-	-	-	-	-	-	-	-	-	106269	30648.5	288.41
32-33	17423	101893	13004	25883	-	-	-	-	-	-	-	-	-	-	158203	51199.9	323.64
33-34	30831	85723	73587	368944	137847	-	-	-	-	-	-	-	-	-	696932	243963.9	350.05
34-35	1930	36073	77044	821601	446454	36419	-	-	-	-	-	-	-	-	1419521	526761.6	371.08
35-36	-	17094	51523	430142	414647	90499	16087	9411	11198	536	-	-	-	-	1041138	413597.8	397.26

36-37	-	-	13870	117183	137195	49553	45461	35857	-	14165	2091	-	-	-	415374	177740.1	427.90
37-38	-	240	8750	6555	67510	122507	55171	65874	20558	3891	4519	-	-	849	356424	167968.9	471.26
38-39	-	-	3216	9513	22823	48643	58684	35338	25589	11734	-	6093	2412	-	224046	112767.8	503.32
39-40	-	-	-	4078	3880	15258	17407	20221	32261	10142	3686	-	638	-	107572	58099.1	540.10
40-41	-	-	-	-	2699	9581	10862	16812	5965	3178	-	12018	-	-	61115	34440.1	563.53
41-42	-	-	-	-	-	-	7624	5605	6839	-	3163	-	1017	-	24248	15733.0	648.84
42-43	-	-	-	-	-	-	535	252	1153	-	-	-	1326	-	3265	2271.2	695.62
43-44	-	-	-	-	81	-	-	-	-	-	-	-	141	-	222	162.1	729.55
44-45	-	-	-	-	-	-	-	-	-	456	-	-	-	-	456	404.1	886.00
TSN(1000)	365593	255651	240994	1783900	1233136	372460	211831	189370	103563	44103	13459	18111	5533	849	4838554	-	-
TSB(1000 kg)	101541.9	87154.6	92125.1	670109.3	484620.1	166927.2	101613.6	94388.4	52960.8	20958.6	7257.9	9774.7	3149.7	392.9	-	1892974.6	-
Mean length (cm)	30.62	33.01	34.33	34.43	34.95	36.59	37.63	37.80	38.42	37.84	38.48	39.45	39.92	37.38	-	-	-
Mean weight (g)	277.75	340.91	382.27	375.64	393.00	448.17	479.69	498.43	511.39	475.22	539.25	539.70	569.20	462.75	-	-	391.23

Variable: Abundance

EstLayer: 1

Stratum: 8

SpecCat: MAKRELL

LenGrp	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57	4.2	73.00
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	1403	-	-	-	-	-	-	-	-	-	-	-	-	-	1403	197.1	140.50
26-27	-	7219	-	-	-	-	-	-	-	-	-	-	-	-	-	7219	1154.2	159.88
27-28	-	47607	-	-	-	-	-	-	-	-	-	-	-	-	-	47607	8118.0	170.52
28-29	-	75803	-	-	-	-	-	-	-	-	-	-	-	-	-	75803	13915.8	183.58
29-30	-	54845	618	-	-	-	-	-	-	-	-	-	-	-	-	55463	11135.5	200.77
30-31	-	27482	1496	-	-	-	-	-	-	-	-	-	-	-	-	28979	6308.8	217.71
31-32	-	5559	1048	-	-	-	-	-	-	-	-	-	-	-	-	6608	1717.5	259.94
32-33	-	4241	3997	-	1434	67	-	-	-	-	-	-	-	-	-	9739	2691.6	276.37
33-34	-	-	1328	4581	13578	981	-	-	-	-	-	-	-	-	-	20468	6322.9	308.92
34-35	-	-	1987	2764	20904	6215	10	-	-	-	-	-	-	-	-	31880	10295.0	322.93
35-36	-	-	-	234	4163	12020	332	1790	1308	-	-	-	-	-	-	19846	6944.9	349.94
36-37	-	-	-	465	3461	8740	145	2969	1867	263	-	-	-	-	-	17909	6668.0	372.32
37-38	-	-	-	23	348	384	934	1297	10502	762	1982	198	46	-	-	16476	6728.6	408.40
38-39	-	-	-	-	7	-	1444	1541	2470	2350	2677	833	65	-	559	11945	5214.6	436.54
39-40	-	-	-	-	-	-	20	2177	5157	527	454	178	-	1808	-	10320	4873.7	472.26
40-41	-	-	-	-	-	-	9	362	3449	215	828	174	-	-	107	5144	2506.8	487.34

LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Number	Biomass	Mean W
41-42	-	-	-	-	-	-	-	-	-	-	301	248	-	-	-	548	328.9	599.81
42-43	-	-	-	-	-	-	-	-	-	31	558	103	-	-	-	692	408.0	589.82
43-44	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	8	5.1	618.00
TSN(1000)	57	224159	10475	8067	43896	28406	2892	10135	24754	4146	6800	1742	110	1808	666	368113	-	-
TSB(1000 kg)	4.2	43002.0	2732.0	2522.9	14254.2	10204.8	1212.0	4185.6	10419.2	1911.6	3095.5	832.9	51.1	811.2	300.0	-	95539.4	-
Mean length (cm)	21.50	28.57	32.25	33.84	34.15	35.20	37.41	37.24	37.89	38.26	38.66	39.07	37.98	39.13	38.38	-	-	-
Mean weight (g)	73.00	191.84	260.82	312.75	324.73	359.25	419.12	412.98	420.91	461.03	455.25	478.09	464.33	448.76	450.48	-	-	259.54

Variable: Abundance

EstLayer: 1

Stratum: 9

SpecCat: MAKRELL

	age																		
LenGrp	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	24	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	2193	2925	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5118	1340.2	261.86
31-32	-	2705	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2705	810.6	299.67
32-33	2999	511	1462	731	-	731	-	-	-	-	-	-	-	-	-	-	6435	2187.2	339.90
33-34	-	6808	-	3658	8272	3512	-	-	-	1631	-	-	-	-	-	-	23881	8387.5	351.21
34-35	-	-	1191	15093	43637	4154	-	5646	-	-	-	-	-	-	-	-	69721	26528.2	380.49
35-36	-	-	4751	14555	51990	52466	20305	836	-	-	-	-	-	-	-	-	144903	58673.8	404.92
36-37	-	-	-	8988	17551	18408	26649	62487	6921	13780	-	-	-	-	-	-	154784	67775.1	437.87
37-38	-	-	-	3983	6904	22280	78832	26947	74860	44696	2086	-	-	-	-	-	260588	123954.7	475.67
38-39	-	-	-	3790	1111	17153	21753	23613	50448	35739	25282	321	232	139	-	-	179580	91492.5	509.48
39-40	-	-	-	255	232	34942	7746	11889	30020	52246	17463	547	137	-	-	-	155477	82714.7	532.01
40-41	-	-	-	-	943	-	1179	4840	6581	16880	8370	2214	3096	1025	-	-	45128	25801.7	571.75
41-42	-	-	-	-	-	-	-	130	2418	7520	4795	2608	8467	273	-	-	26211	15844.1	604.48
42-43	-	-	-	-	-	137	-	-	-	2053	6595	1580	2586	900	-	-	13852	8988.6	648.91
43-44	-	-	-	-	-	-	641	-	85	183	85	286	-	-	-	-	1281	938.1	732.50
44-45	-	-	-	-	-	-	-	-	-	245	-	-	46	-	-	1035	1326	1044.8	787.82
45-46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45	-	45	39.4	867.00

TSN(1000)	5192	12949	7404	51054	130639	153782	157105	136389	171334	174973	64676	7557	14563	2337	45	1035	1091035	-	-
TSB(1000 kg)	1624.5	4064.1	2847.9	20520.6	52413.8	70713.9	73551.5	64819.5	84860.0	90223.3	35203.7	4493.8	8909.1	1423.5	39.4	812.6	-	516521.2	-
Mean length (cm)	31.58	32.09	34.56	35.36	35.13	36.85	37.13	37.16	38.04	38.45	39.30	40.87	41.11	40.98	45.50	44.32	-	-	-
Mean weight (g)	312.87	313.86	384.63	401.94	401.21	459.83	468.17	475.26	495.29	515.64	544.31	594.64	611.75	609.03	867.00	784.98	-	-	473.42

Variable: Abundance

EstLayer: 1

Stratum: 10

SpecCat: MAKRELL

LenGrp	age 2	3	4	5	6	7	8	9	10	11	12	13	14	15	24	Number (1E3)	Biomass (1E3kg)	Mean W (g)
20-21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24-25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29-30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30-31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31-32	1004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1004	253.9	253.00
32-33	686	12011	129	129	129	-	-	-	-	-	-	-	-	-	-	13083	3882.5	296.76
33-34	472	13997	57928	57965	20164	-	129	-	-	-	-	-	-	-	-	150654	50402.0	334.55
34-35	-	25052	69618	185664	92475	5885	1813	109	-	-	-	-	-	-	-	380615	138456.4	363.77
35-36	1157	20511	89510	176093	212796	71363	28601	785	765	2143	472	-	-	-	-	604196	236445.2	391.34
36-37	-	7143	49794	85249	141928	106050	79219	40542	21501	8913	5229	-	-	-	-	545567	227755.7	417.47
37-38	-	-	7414	30092	102435	177013	120149	100519	53780	46503	2529	13859	-	6006	-	660300	302783.5	458.55
38-39	-	1166	-	23025	32533	60091	76426	79669	75064	30172	19182	3588	656	-	-	401572	197113.1	490.85
39-40	-	-	-	1475	11081	16237	38346	54791	45899	33054	12637	7481	4395	-	-	225396	117995.2	523.50
40-41	-	-	-	-	3836	805	8955	11734	13360	15565	5513	527	2526	109	-	62929	35443.5	563.23
41-42	-	-	-	-	-	949	636	5132	5806	5194	2934	218	532	-	-	21401	13239.3	618.63
42-43	-	-	-	-	-	-	472	264	591	855	4815	4607	6006	264	-	17873	10920.0	610.98
43-44	-	-	-	-	264	-	-	-	-	-	109	-	-	-	-	372	260.4	699.13
44-45	-	-	-	-	-	-	-	-	-	-	-	-	119	-	104	223	164.7	739.08
TSN(1000)	3318	79879	274393	559692	617641	438393	354745	293543	216765	142399	53420	30280	14233	6378	104	3085184	-	-
TSB(1000 kg)	1089.0	29197.1	104326.2	216636.7	252824.0	194680.7	164698.9	141608.1	105386.6	69994.9	28242.9	15210.0	8168.7	2980.5	70.9	-	1335115.3	-
Mean length (cm)	32.89	34.02	34.56	34.85	35.61	36.62	37.12	37.69	37.97	38.09	38.71	38.45	40.51	37.26	44.00	-	-	-
Mean weight (g)	328.20	365.52	380.21	387.06	409.34	444.08	464.27	482.41	486.18	491.54	528.69	502.31	573.93	467.30	684.00	-	-	432.75

Appendix 3

Area by year and stratum

Year	Stratum	Area (nm²)	Area (km²)
2007	85	13091.9	44905.2
2007	86	12448.2	42697.3
2007	87	13091.9	44905.2
2007	88	21908.9	75147.7
2007	104	12187.2	41802.1
2007	105	12187.2	41802.1
2007	106	12187.2	41802.1
2007	107	12187.2	41802.1
2007	108	12187.2	41802.1
2007	109	7418.9	25446.9
2007	123	11267.7	38648.1
2007	124	11267.7	38648.1
2007	125	11267.7	38648.1
2007	126	11267.7	38648.1
2007	127	11267.7	38648.1
2007	128	11551.0	39620.0
2007	142	19407.6	66568.1
2007	143	20668.8	70894.0
2007	145	10334.4	35447.0
2007	146	10334.4	35447.0
2007	147	17626.0	60457.2
2007	159	18777.1	64405.4
2007	162	9330.9	32004.9
2007	163	9388.5	32202.7
2007	164	9388.5	32202.7
2007	165	9388.5	32202.7
2007	166	9388.5	32202.7
2007	167	24045.1	82474.6
2007	179	16862.5	57838.3
2007	181	16862.5	57838.3
2007	183	16862.5	57838.3
2007	185	8431.2	28919.1
2007	186	8431.2	28919.1
2007	187	16862.5	57838.3
2007	205	14738.8	50554.0
2010	62	13980.6	47953.6
2010	65	13980.6	47953.6
2010	66	13980.6	47953.6
2010	69	16380.4	56184.7
2010	80	13091.9	44905.2
2010	81	13091.9	44905.2
2010	82	11891.2	40786.7
2010	83	10479.9	35946.0
2010	84	13091.9	44905.2
2010	85	13091.9	44905.2

Year	Stratum	Area (nm²)	Area (km²)
2010	86	12448.2	42697.3
2010	87	13091.9	44905.2
2010	88	21909.0	75147.8
2010	99	12187.2	41802.1
2010	100	14627.8	50173.2
2010	103	6561.5	22506.0
2010	104	12187.2	41802.1
2010	105	12187.2	41802.1
2010	106	12187.2	41802.1
2010	107	12187.2	41802.1
2010	108	19606.2	67249.3
2010	119	11267.7	38648.1
2010	120	10239.0	35119.6
2010	121	9882.8	33897.8
2010	122	10474.7	35928.1
2010	123	11267.7	38648.1
2010	124	11267.7	38648.1
2010	125	11267.7	38648.1
2010	126	11267.7	38648.1
2010	127	11267.7	38648.1
2010	128	11551.0	39620.0
2010	140	10334.4	35447.0
2010	141	10334.4	35447.0
2010	142	10334.4	35447.0
2010	143	10334.4	35447.0
2010	144	10334.4	35447.0
2010	145	10334.4	35447.0
2010	146	10334.4	35447.0
2010	147	10334.4	35447.0
2010	148	8453.8	28996.4
2010	159	18777.1	64405.4
2010	161	9074.6	31125.8
2010	162	9330.9	32004.9
2010	163	9388.5	32202.7
2010	164	9388.5	32202.7
2010	165	9388.5	32202.7
2010	166	9388.5	32202.7
2010	167	9392.8	32217.2
2010	181	8431.2	28919.1
2010	182	8431.2	28919.1
2010	183	8431.2	28919.1
2010	184	8431.2	28919.1
2010	185	8431.2	28919.1
2010	186	16862.5	57838.3
2010	201	14927.3	51200.7

Year	Stratum	Area (nm^2)	Area (km^2)
2010	203	7463.7	25600.4
2010	204	7463.7	25600.4
2010	205	7463.7	25600.4
2010	206	7275.1	24953.6
2010	221	12974.0	44500.8
2010	223	11267.3	38647.0
2011	62	27072.5	92858.8
2011	67	26539.4	91030.2
2011	80	13091.9	44905.2
2011	82	11891.2	40786.7
2011	83	10479.9	35946.0
2011	84	13091.9	44905.2
2011	85	13091.9	44905.2
2011	86	12448.2	42697.3
2011	87	13091.9	44905.2
2011	88	21909.0	75147.8
2011	99	12187.2	41802.1
2011	100	14627.8	50173.2
2011	103	6561.5	22506.0
2011	104	12187.2	41802.1
2011	105	12187.2	41802.1
2011	106	12187.2	41802.1
2011	107	12187.2	41802.1
2011	108	12187.2	41802.1
2011	109	7419.0	25447.2
2011	119	11267.7	38648.1
2011	120	10239.0	35119.6
2011	121	9882.8	33897.8
2011	122	10474.7	35928.1
2011	123	11267.7	38648.1
2011	124	11267.7	38648.1
2011	125	11267.7	38648.1
2011	126	11267.7	38648.1
2011	127	11267.7	38648.1
2011	128	11551.0	39620.0
2011	140	20668.8	70894.0
2011	143	20668.8	70894.0
2011	145	20668.8	70894.0
2011	148	18788.2	64443.4
2011	162	18719.4	64207.5
2011	164	18777.1	64405.4
2011	166	18777.1	64405.4
2012	61	27072.5	92858.8
2012	65	27961.3	95907.2
2012	67	26539.4	91030.2
2012	69	16380.4	56184.7
2012	81	19972.2	68504.5
2012	82	18771.4	64386.1
2012	83	10479.9	35946.0

Year	Stratum	Area (nm^2)	Area (km^2)
2012	84	13091.9	44905.2
2012	85	13091.9	44905.2
2012	86	12448.2	42697.3
2012	87	13091.9	44905.2
2012	88	13091.9	44905.2
2012	89	8817.1	30242.6
2012	99	23454.9	80450.2
2012	100	14627.8	50173.2
2012	103	6561.5	22506.0
2012	104	12187.2	41802.1
2012	105	12187.2	41802.1
2012	106	12187.2	41802.1
2012	107	12187.2	41802.1
2012	108	12187.2	41802.1
2012	109	7419.0	25447.2
2012	119	11267.7	38648.1
2012	120	10239.0	35119.6
2012	121	9882.8	33897.8
2012	122	10474.7	35928.1
2012	123	11267.7	38648.1
2012	124	11267.7	38648.1
2012	125	11267.7	38648.1
2012	126	11267.7	38648.1
2012	127	11267.7	38648.1
2012	128	14306.1	49069.9
2012	140	20668.8	70894.0
2012	142	10334.4	35447.0
2012	143	10334.4	35447.0
2012	144	20668.8	70894.0
2012	146	10334.4	35447.0
2012	148	18788.2	64443.4
2012	162	18719.4	64207.5
2012	164	9388.5	32202.7
2012	165	9388.5	32202.7
2012	166	9388.5	32202.7
2012	167	9388.5	32202.7
2012	183	16862.5	57838.3
2012	185	16862.5	57838.3
2013	12	16540.4	56733.7
2013	31	15706.0	53871.5
2013	32	15656.0	53700.2
2013	47	42214.2	144794.7
2013	50	20297.1	69619.0
2013	61	27961.3	95907.2
2013	65	13980.6	47953.6
2013	66	13980.6	47953.6
2013	67	13511.3	46343.8
2013	68	13028.5	44687.6
2013	69	16380.4	56184.7

Year	Stratum	Area (nm²)	Area (km²)
2013	79	13091.9	44905.2
2013	80	13091.9	44905.2
2013	81	13091.9	44905.2
2013	82	11891.2	40786.7
2013	83	10479.9	35946.0
2013	84	13091.9	44905.2
2013	85	13091.9	44905.2
2013	86	12448.2	42697.3
2013	87	13091.9	44905.2
2013	88	13091.9	44905.2
2013	89	8817.1	30242.6
2013	97	24973.4	85658.9
2013	99	12187.2	41802.1
2013	100	14627.8	50173.2
2013	103	6561.5	22506.0
2013	104	12187.2	41802.1
2013	105	12187.2	41802.1
2013	106	12187.2	41802.1
2013	107	12187.2	41802.1
2013	108	12187.2	41802.1
2013	109	7419.0	25447.2
2013	118	22535.3	77296.2
2013	120	10239.0	35119.6
2013	121	9882.8	33897.8
2013	122	10474.7	35928.1
2013	123	11267.7	38648.1
2013	124	11267.7	38648.1
2013	125	11267.7	38648.1
2013	126	11267.7	38648.1
2013	127	11267.7	38648.1
2013	128	14243.3	48854.6
2013	140	10334.4	35447.0
2013	141	10334.4	35447.0
2013	142	10334.4	35447.0
2013	143	10334.4	35447.0
2013	144	10334.4	35447.0
2013	145	10334.4	35447.0
2013	146	10334.4	35447.0
2013	147	10334.4	35447.0
2013	148	8453.8	28996.4
2013	162	9330.9	32004.9
2013	163	9388.5	32202.7
2013	164	9388.5	32202.7
2013	165	9388.5	32202.7
2013	166	9388.5	32202.7
2013	167	9388.5	32202.7
2013	168	14656.5	50271.9
2013	170	10337.6	35457.8
2013	182	16862.5	57838.3

Year	Stratum	Area (nm²)	Area (km²)
2013	184	8431.2	28919.1
2013	185	8431.2	28919.1
2013	186	8431.2	28919.1
2013	187	8431.2	28919.1
2013	188	8431.2	28919.1
2013	204	7463.7	25600.4
2013	205	14738.8	50554.0
2014	39	14574.9	49991.9
2014	40	14852.4	50943.6
2014	58	8929.4	30627.8
2014	59	13980.6	47953.6
2014	60	13980.6	47953.6
2014	61	41941.9	143860.8
2014	65	13980.6	47953.6
2014	66	13980.6	47953.6
2014	67	13511.3	46343.8
2014	68	13028.5	44687.6
2014	69	16380.4	56184.7
2014	77	4365.7	14974.4
2014	78	13091.9	44905.2
2014	79	13091.9	44905.2
2014	80	13091.9	44905.2
2014	81	13091.9	44905.2
2014	82	11891.2	40786.7
2014	83	10479.9	35946.0
2014	84	13091.9	44905.2
2014	85	13091.9	44905.2
2014	86	12448.2	42697.3
2014	87	13091.9	44905.2
2014	88	13091.9	44905.2
2014	89	8817.1	30242.6
2014	97	21262.4	72930.2
2014	99	12187.2	41802.1
2014	100	14627.8	50173.2
2014	103	6561.5	22506.0
2014	104	12187.2	41802.1
2014	105	12187.2	41802.1
2014	106	12187.2	41802.1
2014	107	12187.2	41802.1
2014	108	12187.2	41802.1
2014	109	7419.0	25447.2
2014	118	26693.4	91558.5
2014	120	10239.0	35119.6
2014	121	9882.8	33897.8
2014	122	10474.7	35928.1
2014	123	11267.7	38648.1
2014	124	11267.7	38648.1
2014	125	11267.7	38648.1
2014	126	11267.7	38648.1

Year	Stratum	Area (nm^2)	Area (km^2)
2014	127	11267.7	38648.1
2014	128	13784.8	47282.0
2014	140	20668.8	70894.0
2014	142	10334.4	35447.0
2014	143	10334.4	35447.0
2014	144	10334.4	35447.0
2014	145	10334.4	35447.0
2014	146	10334.4	35447.0
2014	147	10334.4	35447.0
2014	148	8453.8	28996.4
2014	161	18461.8	63323.8
2014	162	37496.5	128612.9
2014	166	33433.6	114677.2
2014	170	3895.4	13361.1
2014	171	6443.9	22102.5
2014	180	16862.5	57838.3
2014	182	16862.5	57838.3
2014	184	16862.5	57838.3
2014	186	25293.7	86757.4
2014	202	14927.3	51200.7
2014	204	7463.7	25600.4
2014	205	14738.8	50554.0

Year	Stratum	Area (nm^2)	Area (km^2)
2014	222	12974.0	44500.8
2015	1	139687.1	479126.8
2015	2	74799.9	256563.8
2015	3	75434.4	258739.9
2015	4	35823.0	122873.0
2015	5	61487.6	210902.3
2015	6	48947.5	167889.9
2015	7	133673.1	458498.9
2015	8	12135.4	41624.6
2015	9	141403.8	485015.1
2015	10	110228.5	378083.8
2016	1	139687.1	479126.8
2016	2	74799.9	256563.8
2016	3	72648.2	249183.4
2016	4	40380.4	138504.7
2016	5	56100.5	192424.6
2016	6	40515.8	138969.3
2016	7	133673.1	458498.9
2016	8	11272.4	38664.3
2016	9	109880.5	376890.2
2016	10	187153.3	641935.9

Appendix 4

Uncertainty estimates from 500 boostrap replicates, by year and age (total estimates).

Year	Age	5th percentile	median	95th percentile	mean	SD	CV
2007	NA	0.00	0.00	96.87	20.00	38.78	1.94
2007	1	109.14	1499.86	2899.84	1431.38	871.03	0.61
2007	2	583.89	2045.37	3644.32	2096.32	861.44	0.41
2007	3	379.73	914.07	1446.06	914.99	312.98	0.34
2007	4	71.68	250.58	532.77	251.91	153.88	0.61
2007	5	430.09	998.66	1443.27	983.83	311.34	0.32
2007	6	66.49	143.80	233.78	142.84	55.75	0.39
2007	7	29.02	43.94	75.14	46.92	14.70	0.31
2007	8	24.45	35.26	51.04	36.73	9.56	0.26
2007	9	10.35	21.15	42.56	23.28	10.12	0.43
2007	10	4.99	11.62	22.44	12.25	5.15	0.42
2007	11	2.51	9.92	19.68	10.66	5.13	0.48
2007	12	0.06	3.84	10.64	4.48	3.13	0.70
2007	13	1.06	2.77	11.36	3.89	3.30	0.85
2007	14	0.08	0.37	2.67	0.74	1.48	2.01
2007	15	0.00	1.43	7.01	2.06	2.55	1.24
2007	16	0.00	0.04	0.21	0.07	0.10	1.58
2010	NA	0.85	26.96	54.61	27.05	21.07	0.78
2010	1	0.36	7.66	18.30	8.06	5.73	0.71
2010	2	1096.56	3471.98	6094.34	3493.34	1860.01	0.53
2010	3	1332.45	1656.75	1989.19	1658.39	205.22	0.12
2010	4	3327.88	3970.56	4776.85	3997.79	448.51	0.11
2010	5	2436.64	3109.29	3749.20	3109.11	402.40	0.13
2010	6	1203.58	1500.35	1855.78	1512.12	198.32	0.13
2010	7	450.39	688.47	926.60	686.96	144.00	0.21
2010	8	245.11	406.64	564.67	406.69	94.31	0.23
2010	9	119.93	197.63	307.03	203.31	57.31	0.28
2010	10	41.25	64.82	96.62	66.25	17.40	0.26
2010	11	11.98	25.87	46.35	27.10	10.65	0.39
2010	12	13.90	24.65	40.66	25.58	8.25	0.32
2010	13	3.69	10.69	21.53	11.33	5.52	0.49
2010	14	1.38	6.25	12.54	6.38	3.81	0.60
2010	15	0.00	0.04	0.57	0.18	0.53	3.00
2011	NA	32.35	218.95	429.86	228.53	122.37	0.54
2011	1	126.60	377.69	701.34	395.84	179.03	0.45
2011	2	527.30	894.04	1305.29	904.78	237.18	0.26
2011	3	1453.40	1920.51	2502.65	1947.24	314.83	0.16
2011	4	1122.42	1451.43	1746.89	1444.29	190.37	0.13
2011	5	1700.42	2323.13	2920.52	2316.99	359.15	0.16
2011	6	1077.41	1323.67	1554.53	1319.28	147.46	0.11
2011	7	546.29	751.23	943.22	749.41	118.43	0.16
2011	8	212.18	298.92	395.67	303.15	56.27	0.19
2011	9	99.91	161.35	229.20	162.10	38.96	0.24

Year	Age	5th percentile	median	95th percentile	mean	SD	CV
2011	10	56.22	170.46	269.98	162.39	70.63	0.43
2011	11	12.38	22.43	36.99	23.38	8.10	0.35
2011	12	7.03	15.55	28.43	16.33	6.99	0.43
2011	13	0.10	9.28	25.48	10.80	8.28	0.77
2011	14	0.00	7.80	24.89	9.34	7.91	0.85
2012	NA	0.00	2.84	44.69	11.94	19.70	1.65
2012	1	582.00	907.34	1173.17	894.12	185.06	0.21
2012	2	3207.41	5465.84	8095.36	5487.79	1516.61	0.28
2012	3	950.66	1239.85	1566.98	1247.78	189.08	0.15
2012	4	2075.53	2431.52	2793.08	2433.63	214.20	0.09
2012	5	1731.44	2137.67	2556.69	2142.16	251.98	0.12
2012	6	2472.31	2888.78	3281.90	2886.97	243.29	0.08
2012	7	1535.28	1804.00	2153.93	1819.69	195.26	0.11
2012	8	593.47	738.89	918.29	746.56	104.19	0.14
2012	9	224.01	305.92	419.93	312.72	63.36	0.20
2012	10	83.13	123.83	183.91	126.69	30.13	0.24
2012	11	43.50	76.43	112.71	77.77	20.32	0.26
2012	12	18.44	30.71	50.18	32.15	9.67	0.30
2012	13	0.73	4.89	14.02	5.92	4.76	0.80
2012	14	0.00	0.31	6.55	1.49	3.22	2.17
2012	15	0.00	0.36	3.94	1.09	1.71	1.57
2012	16	0.00	0.11	1.72	0.40	1.02	2.54
2013	NA	23.20	42.15	61.29	42.27	11.46	0.27
2013	1	33.07	72.85	114.46	73.26	24.71	0.34
2013	2	6021.30	7550.79	9156.84	7555.41	924.88	0.12
2013	3	8768.12	9689.78	10758.87	9691.38	607.81	0.06
2013	4	1965.43	2469.11	2934.29	2458.16	296.02	0.12
2013	5	2583.62	3061.19	3670.88	3081.68	337.71	0.11
2013	6	2827.36	3119.86	3466.49	3133.23	196.12	0.06
2013	7	2169.46	2626.41	3193.11	2649.49	319.85	0.12
2013	8	920.51	1168.46	1407.88	1168.79	153.11	0.13
2013	9	336.85	399.75	467.54	401.32	39.64	0.10
2013	10	117.46	163.11	221.88	166.82	32.94	0.20
2013	11	78.70	161.39	249.11	157.26	53.72	0.34
2013	12	30.16	48.11	69.67	48.89	13.07	0.27
2013	13	2.51	6.59	13.72	7.31	3.88	0.53
2013	14	0.08	2.38	8.74	3.08	2.80	0.91
2013	15	5.57	13.76	25.04	14.49	6.08	0.42
2014	NA	0.12	4.66	23.68	8.40	8.08	0.96
2014	1	0.00	10.89	16.66	8.48	6.47	0.76
2014	2	410.16	530.46	711.91	541.25	89.82	0.17
2014	3	6033.80	7018.58	8082.03	7043.31	641.81	0.09
2014	4	4223.98	4908.25	5715.75	4927.44	457.04	0.09
2014	5	2264.16	2741.63	3140.69	2717.09	280.52	0.10
2014	6	2226.33	2704.39	3090.49	2688.06	258.71	0.10
2014	7	2362.40	2810.07	3239.85	2802.81	263.82	0.09
2014	8	1616.48	1874.81	2122.03	1872.61	151.70	0.08
2014	9	641.22	856.51	1079.71	856.26	133.89	0.16
2014	10	289.88	377.05	476.21	380.93	57.18	0.15

Year	Age	5th percentile	median	95th percentile	mean	SD	CV
2014	11	65.77	109.93	159.10	111.15	29.87	0.27
2014	12	29.43	64.40	106.04	65.58	23.87	0.36
2014	13	8.19	24.34	48.50	25.82	12.94	0.50
2014	14	0.00	0.84	10.00	2.60	3.44	1.33
2014	15	0.19	1.09	6.83	1.86	2.37	1.27
2015	NA	0.000	0.000	18.473	1.746	6.581	3.769
2015	1	394.10	830.64	1484.66	873.69	340.40	0.39
2015	2	542.45	851.03	1238.74	868.37	215.12	0.25
2015	3	1893.05	2389.11	3017.38	2414.19	344.71	0.14
2015	4	5050.49	6356.70	8016.62	6451.93	901.42	0.14
2015	5	3840.95	4816.30	5798.04	4816.82	625.98	0.13
2015	6	1481.70	1823.35	2166.07	1825.94	214.33	0.12
2015	7	1230.83	1601.28	2004.09	1597.11	235.13	0.15
2015	8	851.48	1203.90	1591.24	1212.86	218.96	0.18
2015	9	486.08	731.08	1019.09	729.39	164.67	0.23
2015	10	174.91	269.94	379.68	270.65	61.14	0.23
2015	11	33.04	61.04	99.90	63.67	21.01	0.33
2015	12	20.73	43.87	73.31	44.58	16.09	0.36
2015	13	2.73	7.07	13.99	7.53	3.55	0.47
2016	NA	0.53	2.51	42.84	7.38	13.32	1.81
2016	1	0.21	1.70	4.18	1.87	1.21	0.65
2016	2	3529.05	4911.00	6382.01	4922.86	895.05	0.18
2016	3	1096.48	1409.14	1794.71	1412.52	209.51	0.15
2016	4	2005.08	2610.75	3299.48	2636.61	399.66	0.15
2016	5	4134.11	5126.82	6344.63	5160.30	681.78	0.13
2016	6	3217.02	4324.99	5535.04	4340.74	722.01	0.17
2016	7	1404.24	1863.83	2351.98	1878.47	299.34	0.16
2016	8	1302.52	1674.96	2093.18	1687.14	237.98	0.14
2016	9	865.57	1130.94	1463.97	1142.48	188.53	0.17
2016	10	558.03	746.01	969.61	749.65	125.51	0.17
2016	11	273.90	413.40	600.93	423.92	100.98	0.24
2016	12	142.42	218.48	303.07	221.32	48.72	0.22
2016	13	39.50	68.64	108.99	70.63	21.31	0.30
2016	14	24.53	47.74	78.68	49.29	16.83	0.34
2016	15	4.84	17.44	37.23	18.92	10.33	0.55
2016	16	0.00	0.15	0.35	0.14	0.13	0.92
2016	17	0.00	0.39	1.07	0.42	0.38	0.89
2016	24	0.00	0.89	3.14	1.08	1.11	1.02

Appendix 5

Uncertainty estimates from 500 boostrap replicates, by year and age (total estimates) for 2013 when stratum 12, 31, 32, 47 and 50 are excluded.

Year	Age	5th percentile	median	95th percentile	mean	SD	CV
2013	NA	20.10	41.27	62.67	41.47	12.73	0.31
2013	1	13.51	29.28	55.89	31.01	13.23	0.43
2013	2	4962.54	6386.01	7838.96	6422.16	875.94	0.14
2013	3	8333.60	9229.40	10248.53	9241.55	570.04	0.06
2013	4	1916.24	2423.82	2892.47	2417.15	292.77	0.12
2013	5	2560.50	3047.98	3659.96	3065.35	338.52	0.11
2013	6	2784.28	3087.32	3442.27	3094.50	197.31	0.06
2013	7	2128.57	2571.25	3131.51	2601.81	320.56	0.12
2013	8	881.41	1132.49	1374.17	1134.15	148.60	0.13
2013	9	304.24	372.55	435.87	372.09	41.69	0.11
2013	10	105.72	146.94	202.52	149.88	30.54	0.20
2013	11	63.23	149.83	235.68	145.94	55.68	0.38
2013	12	24.16	41.62	61.51	42.10	12.11	0.29
2013	13	2.51	6.96	13.92	7.59	3.94	0.52
2013	14	0.08	2.26	8.32	3.09	2.86	0.93
2013	15	5.41	13.90	24.56	14.37	6.03	0.42

Annex 10: Answers to "Recommendations to WGIPS"

ID	From	Year	Recommendation	Final recipient action
3	WKNSSAGE	2016	Stock mixing issues during the May survey needs to be addressed	This recommendation has been delivered to the relevant institutes
4	WKNSSAGE	2016	Sampling of both structures from the same fish	This recommendation has been delivered to the relevant institutes. Norway has already done this for the spawning ground survey in February and plan to sample both otoliths and scales from a number of fish in the 2017 IESNS.
5	WKNSSAGE	2016	Standardization / calibration of sampling procedures	This was addressed with analyses on survey data in a WD (Óskarsson et al. 2016) to WKPELA 2016 (ICES 2016). The main conclusion there was that the biological trawl sampling in the survey is representative for the acoustic registrations with respect to depth. However, a recommendation arriving from this work, and aimed at WGIPS, is that the acoustical data should be delivered to the database at 10m depth channels in the future, which will allow for more thorough analyses and quantification of potential variation in quantity of fish in the acoustic dead zone and fish avoidance from the approaching vessels.

61	HAWG	2016	HAWG recommends to WGIPS to deliver on an annual basis the requested features and estimates of acoustic survey results, model fitting process and uncertainties herein (Table 1.2.2 HAWG 2016).	The majority of the requested summaries are already provided as standard in the relevant survey reports. Table 1.2.2 from HAWG 2016 has been filled in with location in the reports where the requested information can be found (Annex 11). Standard tables addressing the remaining requests will be added to the cruise report in the future where possible. Some metrics cannot easily be delivered at the individual stock level for example for NSAS and WBSS stocks for some strata due to stock splitting methods used at the present (numbers aged, level of ichthyophonus infection for example). Work is ongoing to allow the provision of estimates of uncertainty for all stock estimates.
62	HAWG	2016	HAWG recommends that WGFAST and WGIPS have an active role in developing the 6a-7bc herring industry acoustic survey that is being planned for 2016 under the auspices of the PELAC (Pelagic Advisory Council). The inclusion of industry acoustic surveys into the data sources for expert groups is an important new development that would benefit from expertise on acoustics and survey design. A review of the foreseen 2016 industry acoustic survey in the 2017 is needed to assess the quality of the survey for further inclusion in the ICES advisory system. It is envisaged that WGIPS	See section 3 and 4 of the VIa survey report (Annex 5g), which provides WGIPS recommendations on the 2016 survey results and considerations for possible future surveys.

			and WGFAST would be involved in this review process.	
63	HAWG	2016	HAWG considers that every effort be made to maintain the existing time series (to maintain catchability) of the CSHAS survey, while ensuring a full coverage of the stock.	A revised survey design, with extended coverage, was implemented in 2016 taking into consideration the integrity and maintainance of the existing survey index
64	HAWG	2016	To investigate the potential of the MSHAS/Boarfish survey conducted in June/July as, and coordinated by WGIPS, as an additional abundance index for Celtic Sea herring and Celtic Sea sprat, and whether amendments would be required before this survey could be	It is intended that the 2017 WESPAS survey will investigate the summer distribution of herring in the eastern Celtic Sea (Celtic Deep) by extending the current survey design. However, due to time constraints the core work takes priority. The potential exists to provide herring abundance data within the existing program but this is time limited. However, to contain the sprat stock would be outside the limits of this survey without significant change that would requires additional survey days. The survey will report back to WGIPS in 2018 on the success of herring coverage and future recommendations.

			operational for that purpose.	
65	HAWG	2016	To investigate the potential of the PELTIC survey conducted in October as, and coordinated by WGIPS, as an additional abundance index for Western Channel sprat, and whether amendments would be required before this survey could be operational for that purpose.	Sprat is one of the target species of the survey; i.e. the timing (beginning of the sprat fishing season) and design (e.g. daylight only) were adapted to enable reliable data collection to ultimately achieve an abundance index for Western Channel sprat. The results of the time series thus far have shown that the spatial extent of the Western Channel population appears to be captured within the survey design. Main questions at the moment are: 1. where are the juveniles and 2: is the survey design suitable when sprat population is low in abundance (or highly aggregated). In 2017 the coastal Lume Bay region will be sampled at higher resolution acoustic transects grids to ensure the appropriateness of the current design in years of lower abundance; in 2017 more trawls will be conducted to hopefully capture a larger variety of size classes (as juvenile sprat appear under represented); preliminary (but unconfirmed) plans to extend the survey into the Eastern Channel are aimed to identify Eastern Channel sprat and their relationship with those in the Western Channel.

81	WGFAST	2016	1. WGFAST recommends to verify and if necessary include in survey manuals for acoustic surveys (SISPs) details on minimum data quality for acoustic and trawl data collection on research or hired vessels participating in surveys. For acoustic data this includes the list of echosounder frequencies, etc. For trawl data this includes the type of trawl and the auxilliary data to be collected.	The required data quality depends very much on the objective of the survey and this is indeed an issue that can be addressed by individual surveys (National or International). WIPS members can cross check details (on board protocols and equipment) in national manuals with the SISP manual. The manual is reviewed and kept up to date at WGIPS contains the required details on data quality. It was remarked that a list of frequencies or specific trawl requirements may increase the chance to collect good quality data but it certainly does not guarantee it. There are many examples of situations where data were (had to be) collected in bad weather or under otherwise unfavourable conditions and provided data that were “better than nothing”. In these cases it comes down to proper reporting of the conditions and the possible biases that may be at stake. The survey coordinators can then decide whether data should be included, taking all issues into account.
242	WKHERLARS2	2016	1a. WKHERLARS2 recommends that the LAI (SCAI) index be improved by adding information of the newly hatched herring larvae from the IBTS MIK survey. It is therefor essential that: 1b. the IBTS MIK sampling in the English Channel is continued and 2. that the newly hatched larvae data are reported from the historic samples.	1a. WGIPS supports the request by WKHERLARS2 (to IBTSWG) making information from the MIK sampling on the abundance of newly hatched larvae in the English Channel accessible. Once these data are available, WGIPS will introduce a dedicated study on the benefit of the inclusion of such data on the IHLS estimates of the Southern North Sea. 1b. WGIPS is not responsible for any sampling related to the MIK nor does WGIPS make any use of the MIK data so far. This will have to be addressed by IBTSWG. 2. see above and 1a.

246	WKHERLARS2	2016	5. WKHERLARS2 recommends the collection of otoliths from young fish caught in the Acoustic survey (HERAS), 3rd Quarter IBTS and the IMR transect sampling in November/December for baseline samples to be used in WKISDA: 1. 0- and 1-wr herring otoliths for shape analyses and optical density of the core area (HERAS) 2. 0- and 1-wr herring otoliths for shape analyses and optical density of the core area (3QIBTS) 3. 0-wr larvae from the northern North Sea.	WGIPS has been in contact with the WKHERLARS2 chairs and agreed that the respective samples will be collected during the German pat of HERAS
	WGINOR		1. Collect water samples for measuring nutrient concentration (nitrate and silicate, at standard depths) in the International Ecosystem Survey in Norwegian Sea in July/August (IESSNS) and May (IESNS).	This recommendation is problematic for IESSNS where charter fishing vessels are used by all countries, except Iceland, because the fishing vessels don't have a transmission cable for the CTD and have therefore simpler CTDs without rosette of multi water samplers. For IESNS, this will be seriously considered by parties not already doing this (FO, EU, and RU).

	WGINOR		2. Take CTD measurements down to 1000 m instead of 500 m in the International Ecosystem Summer Survey in Nordic Seas (IESSNS)	The IESSNS group feel that the survey time does not allow for this addition given the time constrains for each of the vessels. The total number of CTDs taken in the survey in 2016 was 284 so extra 500m at each station takes (284x2x500 seconds) ~3.3 days (0.95 days for IS, 1.6 d for NO, 0.23 d for GL and 0.45 d for FO). A sound justification for this significant addition is therefore needed to be included in the annual projects proposals for the different institutes for validation.
	WGINOR		3. Opportunistic sightings of marine mammals should take place in all vessels participating in IESSNS. A thorough protocol for it will be completed in 2017.	The IESSNS countries not doing this sightings previously (FO, IS, and GL; note that the Greenlandic part of the survey does not cover Norwegian Sea) will aim for doing this in the 2017 survey and follow then the protocol from NO.
	WGINOR		4. For getting quantitative estimates of macro-zooplankton in the Norwegian Sea, it is recommended that participating vessels in IESNS and IESSNS utilize a standardized krill trawl during the surveys in a manner described in protocol compiled within WGINOR 2016 (Annex 3).	This has become a standard procedure in IESNS by IS and NO. FO and EU don't have this kind of a krill trawl, but will take the recommendation to their institutes for discussion. Further, information about requested sampling effort needs to be provided by WGINOR. In IESSNS this can't be easily done because of time constrains. Consequently, justification and estimated effort (e.g. number of trawl stations and duration of the trawling) needs to be provided to be included in the annual project proposals for the different institutes for validation.
	WGINOR		5. Stomach weighing of all mackerel, herring and blue whiting collected for age determination in IESSNS should be a standard procedure and come	This recommendation has been delivered to the relevant institutes and they will verify how this fits to their sampling procedure and software used for recording the measurements.

			additional or replace recordings of stomach fullness (see details in Annex 4).	
	WGINOR		6. Several sources of sample variance in zooplankton net sampling (WP2) have been identified and recommendations given to reduce them (see Annex 6 in the 2016 WGINOR report (ICES 2017). It is recommended that these guidelines will be followed in future surveys (e.g. IESNS and IESSNS).	The parties participating in IESNS and IESSNS have received this recommendation and will aim for following these guidelines as thoroughly as possible.

Annex 11: Location of information requested by HAWG 2016

Stock	NSAS	WBSS	WBSS	6.aN	Malin shelf	Irish Sea	Celtic Sea
Survey synonym	*HERAS*	*HERAS*	*GERAS*	*HERAS*	*HERAS*	*ISAS*	*CSHAS*
Report location	*Annex 4.c*	*Annex 4.c*	*Annex 5.a*	*Annex 4.c*	*Annex 4.c*	*Annex 5.b*	*Annex 5.c*
Numbers at age	Table 5.2	Table 5.3	Table 5a.13	Table 5.4	Table 5.5	Table 5B.3	Appendix 1
Biomass at age	Table 5.2	Table 5.3	Table 5a.15	Table 5.4	Table 5.5	X	Appendix 1
Maturity at age	Table 5.2	Table 5.3	X	Table 5.4	Table 5.5	X	Appendix 1
Weight at age	Table 5.2	Table 5.3	Table 5a.14	Table 5.4	Table 5.5	X	Appendix 1
Length at age	Table 5.2	Table 5.3	X	Table 5.4	Table 5.5	Table 5B.3	Appendix 1
Immature fish: numbers, biomass, mean length, mean weight	Table 5.2	Table 5.3	X	Table 5.4	Table 5.5	X	Appendix 1
Mature fish: numbers, biomass, mean length, mean weight	Table 5.2	Table 5.3	X	Table 5.4	Table 5.5	X	Appendix 1
Survey coverage	Figure 5.2	Table 5.3	Figure 5a.1	Table 5.4	Table 5.5	Table 5B.1	Figure 1
Track length per stratum (comparing last two years)	Table 5.18	Table 5.18	X	Table 5.18	Table 5.18	X	X
Number of fish aged per stratum and in total (comparing last two years)	Table 5.18	Table 5.18	X	Table 5.18	Table 5.18	X	X
Short description on survey quality, issues, CV (where possible)	Summary Table	Summary Table	Summary Table	Summary Table	Summary Table	Summary Table	Summary Table

Level of *Ichthyophonus* infection	Not reported 2016	Not reported 2016	Not reported 2016	Not reported 2016	Not reported 2016	Not reported 2015	Not reported 2016

Stock	**Sprat NS**	**Sprat 3.a**
Report location	***Annex 4.c***	***Annex 4.c***
Survey synonym	HERAS	HERAS
Total numbers at age	Table 5.10	Table 5.12
Biomass at age	Table 5.10	Table 5.12
Maturity at age	Can be calculated from Table 5.10	Can be calculated from Table 5.12
Weight at age	Table 5.10	Table 5.12
Length at age	Table 5.10	Table 5.12
Immature: numbers, biomass, mean length, mean weight	Table 5.10	Table 5.12
Mature: numbers, biomass, mean length, mean weight	Table 5.10	Table 5.12
Survey coverage and nautical miles used in abundance estimates	Table 5.18	Table 5.18
Track length per stratum (comparing last two years)	Table 5.18	Table 5.18
Number of fish aged per stratum and in total (comparing last two years)	Table 5.18	Table 5.18
Short description on survey quality, issues, CV (where possible)	Summary table	Summary table